Appendix B

Haile Gold Mine EIS

Compensatory Mitigation Plan

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Haile Gold Mine Mitigation Plan

SAC 1992-24122-4IA

Lancaster County, S.C.

July 9, 2013

Prepared for:

Haile Gold Mine, Inc.

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Executive Summary
Haile Gold Mine Mitigation Plan

Haile Gold Mine, Inc. (Haile) has worked diligently to avoid, minimize and mitigate impacts associated with the construction and operation of the Haile Gold Mine. Through the permitting and EIS process, Haile coordinated with state and federal agencies, non-governmental organizations (NGO) and public interest groups to identify appropriate and adequate mitigation. This process has involved numerous meetings and discussions to identify outstanding aquatic resources that could obtain protection through the Haile mitigation plan. The culmination of these efforts is a mitigation plan that fully compensates for any impacts to aquatic resources expected to arise at the Haile Gold Mine project site.

The objective of the mitigation plan is to mitigate for all of the impacts associated with the construction and operation of the Haile Gold Mine project site, by assuring that outstanding aquatic resources, as well as cultural and historic resources, are preserved and a significant endowment is provided to the South Carolina Department of Natural Resources (SCDNR) for maintenance and management for the benefit of regional aquatic functions.

Under the plan, outstanding aquatic resources will become part of South Carolina's Heritage Trust Program, removed from any threat of development and preserved for the benefit of the regional environment. The sites constituting the plan are summarized here:

Haile Gold Mine – Mitigation Plan Elements			
Mitigation Activity	**Wetland Acres**	**Stream/River LF**	**Total Acreage**
Land Preservation Rainbow Ranch Site	28.11	19,714	698.00
Land Preservation Cooks Mountain Site	485.10	28,292/10,289	1,131.80
Land Preservation Goodwill Plantation Site	1,048.10	30,706/29,560	2,559.00
Totals	1,561.31	118,561	4388.80

In brief, these sites offer the following:

Rainbow Ranch: The Rainbow Ranch Site is located adjacent to SCDNR's Forty Acre Rock Heritage Preserve (Preserve) and the Carolina Heelsplitter Conservation Bank in the Lynches River Watershed. The site includes ±8,551 LF of flat creek, which was designated by USF&WS in 1993 as critical habitat for the endangered Carolina Heelsplitter (Lasmigona decorata). The addition of Rainbow Ranch to the Preserve will increase the size of the Preserve by 30%. The opportunity to expand the protected habitat and management for the Carolina Heelsplitter establishes the Rainbow Ranch Site as a unique property and a high priority for acquisition and preservation within the Lynches River Watershed.

Cooks Mountain: The Cooks Mountain Site is located within the Wateree River Watershed and the 215,000 acre COWASEE (Congaree, Santee, and Wateree) Basin Focus Area, a land conservation partnership including SCDNR, NRCS, DU, Congaree Land Trust, Friends of Congaree Swamp, Richland Co. Conservation Commission and Sumter County Soil and Water Conservation District. With elevations approaching 400 feet above sea level adjacent to the Wateree River, ± 260 feet above the river itself, the Cooks Mountain Site is a unique landform to be found in the midlands of S.C. The site contains an extremely diverse ecology and outstanding scientific, educational, aesthetic and recreational characteristics.

Goodwill Plantation: The Goodwill Plantation Site is located within the Wateree River Watershed and the COWASEE Basis Focus Area. The site contains outstanding examples of historic and archaeological resources, a diverse ecology and opportunities for scientific research, education and recreation. Goodwill Plantation is considered a linchpin property and a high priority for acquisition and preservation by the partners of the COWASEE Basin Focus Area.

Additionally, the mitigation plan provides substantial financial support to the South Carolina Department of Natural Resources (SCDNR) to protect, maintain and, as it deems appropriate, restore or enhance the resources of the sites. An endowment totaling $4.5 million will be provided to SCDNR for maintenance and management of the sites. An additional amount of $4.9 million will be provided to SCDNR specifically for projects for the benefit of the heelsplitter mussel. Haile will work with SCDNR to provide a transfer of the fee title to the sites with appropriate arrangements for payment and use of the endowment funds.

In total, this mitigation plan represents a unique and outstanding opportunity to accomplish landscape scale conservation.

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Appendices

1.0 INTRODUCTION

The Haile Gold Mine Mitigation Plan is submitted in support of a permit application (P/N #SAC 1992-24122-4IA) submitted to the United States Army Corps of Engineers (USACE) and the South Carolina Department of Health & Environmental Control (SCDHEC) by the property owner, Haile Gold Mine, Inc. (Haile). The mine will be constructed and operated on a 4,552 acre property in Lancaster County S.C. The project site is within the Lynches River watershed (Hydrologic Unit Code (HUC) 03040202) and EPA Level IV Sandhills and Carolina Slate Belt Ecoregions. Mining will occur over an approximately twelve year period. The application proposes direct impacts to 120.46 acres of wetlands and 26,460.54 linear feet (LF) of streams. Indirect impacts may include long term, but temporary, depressurization of groundwater in adjacent wetlands and streams that are not directly affected by proposed mining activities.

Haile submitted a joint permit application to the USACE and SCDHEC in December, 2010, which included a Permittee Responsible Mitigation (PRM) Plan. The USACE published a public notice (PN) January 28, 2011. The PRM Plan was revised in May, 2011. The USACE advised Haile that a National Environmental Policy Act (NEPA) Environmental Impact Statement (EIS) would be required for the project on July 1, 2011. A revised permit application based on revised project plans was submitted to the agencies August 16, 2012.

The Corps has been assembling information to prepare its EIS. During the EIS development process, reviewing state and federal agencies and non-governmental organizations (NGO) raised a number of comments on the PRM plan as proposed in 2011. Through continued discussions and coordination, NGOs advised Haile that they would prefer a PRM plan that focused on outstanding aquatic resources; without pre-judging their respective obligations, various federal and state agencies also indicated that a plan that protected such outstanding resources was appropriate for the Haile Gold Mine project. Haile coordinated with these entities to seek out alternative mitigation opportunities with unique and outstanding resource values that could provide environmental benefits on a regional scale.

It is the intent and commitment of Haile to fully and adequately mitigate the direct and indirect unavoidable impacts resulting from all future activities at the Haile Gold Mine, including those impacts identified in this permit application through this Mitigation Plan. To that end, this document will summarize the process undertaken to arrive at the appropriate mitigation and describe a specific mitigation plan. The plan provides sufficient and appropriate compensatory mitigation for the activities identified in the permit application as well as possible indirect impacts or impacts from any future activities that may be identified in a permit amendment or new permit application for the Haile Gold Mine Project site.

2.0 MITIGATION OPTIONS AND PROCESS

2.1 Applicability of the Mitigation Rule

The 2008 USACE and United States Environmental Protection Agency (USEPA) Mitigation Rule (Rule), 33 C.F.R. Parts 325 and 332 and 40 C.F.R. Part 230, directs the District Engineer (DE) to consider what would be "practical . . . capable[,]. . . and environmentally preferable" when evaluating compensatory mitigation options (33 C.F.R. § 332.3 (a)(1)). The Rule establishes the following hierarchy/preference for mitigation:

1. Mitigation Bank Credits
2. In-Lieu- Fee Program Credits
3. Permittee Responsible Mitigation

33 C.F.R. § 332.3(b). Notwithstanding this preference, the Rule also provides that "[w]here permitted impacts are not in the service area of an approved mitigation bank or in-lieu-fee program that has the appropriate number and resource type of credits available, permittee responsible mitigation is the only option." 33 C.F.R. § 332.3(b)(4). The Haile Gold Mine project site, located within HUC 03040202, is not within the service area of an approved mitigation bank or in-lieu-fee program, therefore, according to the Rule, PRM is the only option. PRM may be accomplished using on-site and in-kind mitigation or off-site and out-of-kind mitigation, as may be determined by the DE. 33 C.F.R. § 332.3(b)(4)-(6). The Rule emphasizes consideration of mitigation in a

watershed approach, so that compensatory mitigation can be implemented to meet watershed needs. Prior to and during the permitting/EIS process, Haile considered watershed needs for its PRM. The Lynches River watershed has been evaluated by Haile and the agencies for mitigation opportunities that could provide environmental benefits on a watershed and regional scale appropriate for the Haile project. The Rainbow Ranch Site is an outstanding resource, suitable, adequate and available for compensatory mitigation within HUC 03040202. Other outstanding resources used in the Haile PRM are not within the Lynches River watershed but do represent high priority conservation lands with outstanding resources including significant aquatic functions within the Wateree River watershed. Given the scale of the mining operations anticipated at the Haile site, on-site compensatory mitigation is not practicable as well. The PRM plan sites that Haile proposes to use, accomplish in part, in-kind mitigation, by protecting similar wetland and stream resources to the impacted resources. The Rule authorizes the DE to consider and accept off-site and/or out-of-kind mitigation opportunities, including those in adjacent watersheds that have a "greater likelihood of offsetting project impacts" or are "environmentally preferable". 33 C.F.R. § 332.3(b)(6). Haile proposes in this document, a combination of off-site, in-kind and in-watershed, as well as, off-site, out- of kind and out-of watershed mitigation accomplished through preservation of outstanding aquatic resources. Given the nature of the PRM plan resources, the DE has ample foundation to conclude that this plan is "environmentally preferable."

The Rule allows mitigation through preservation in the sound discretion of the DE, consistent with the following criteria:

- Resources to be preserved provide important physical, chemical and biological functions and contribute significantly to the ecological sustainability of the watershed;
- The DE determines preservation is appropriate and practicable;
- Resources to be preserved are under threat of destruction or adverse modification; and
- The proposed preservation sites will be permanently protected by third party conservation easement or title transfer to a state resource agency or land trust.

33 C.F.R. § 332.3(f). Additionally, the Rule provides that preservation alone may compensate for permitted impacts to aquatic resources "where preservation has been identified as a high priority using the watershed approach . . . ." 33 C.F.R. § 332.3(h)(2). The mitigation sites proposed by Haile are consistent with these criteria. Haile has proposed mitigation using outstanding resources within their watersheds. Moreover, in determining the suitability of a mitigation site, the DE is to consider a number of factors described at 332.3(d), including, "local or regional goals for restoration or protection of particular habitat types or functions". The coordination and consultation process that Haile conducted with NGO's and state and federal agencies provided direction to find sites that are regionally significant and especially warrant the protection that Haile's mitigation plan will provide.

As specified in 33 C.F.R. § 332.3 (f) of the Rule, the DE must be satisfied that the type and amount of mitigation provided will compensate for project impacts. This Plan demonstrates that the mitigation offered more than compensates for impacts (now and in the future) at the Haile project site, by virtue of the details of the aquatic, cultural, historic and regionally significant resources that are included.

2.2 Applicability of the Charleston District Compensatory Mitigation Guidelines

The USACE Charleston District Guidelines For Preparing A Compensatory Mitigation Plan, Working Draft, Last Revised October 7, 2010 (Guidelines), are a local guidance document intended to assist permit applicants in developing mitigation plans. As the Guidelines are intended to implement the 2008 Mitigation Rule, compliance with one should be consistent with the spirit and intent of the other. Ultimately, a mitigation plan must satisfy the Rule, which has force of law. Notably, Section 4.0 of the Guidelines provides that compensatory mitigation may be accomplished by "…preservation of an outstanding aquatic resource that is determined to be important to the long term success and sustainability of the surrounding watershed… ." This statement is consistent with the Rule's approach which authorizes satisfaction of mitigation requirements through preservation. The Haile PRM plan is focused on preservation of outstanding aquatic resources of regional importance.

3.0 PROPOSED MITIGATION

An important component of the mitigation process is the demonstration of avoidance and minimization. To that end, Haile has worked with the needs of the project, the physical constraints of the site and the regulatory and reviewing agencies to avoid and minimize impacts to the greatest extent practicable. Haile's avoidance and minimization is set out in the August 2012 revised permit application, which compares the impacts as proposed in 2011 against the impacts identified in 2012. The 2011 Mine Plan resulted in the impact of 160.81 acres of wetland and 38,775 linear feet of stream, while the 2012 application shows that through adjustments in the project configurations, impacts were reduced to 120.46 acres of wetlands and 26,460.54 linear feet of stream. Likewise, coordination with the affected communities, various agencies and NGO's during this process has resulted in identification and development of a mitigation plan that fully and adequately compensates for all unavoidable impacts.

To the maximum extent practicable, the proposed compensatory mitigation provides "in-kind" mitigation to offset the proposed impacts in that the proposed preservation sites contain resources that are: 1) the same functional classification (e.g. Cowardin classification or stream order), 2) within the same watershed or ecoregion as the impacted resource and 3) located within the same or similar landscape as the impacts associated with Haile Gold Mine. The significant benefits obtained by protection of the mitigation resources warrants flexibility in the level of detail appropriate to compare the resources impacted to the compensatory mitigation resources.

The Rule, at 33 C.F.R. § 332.4(c), describes the components of a mitigation plan. These components, as they are applicable to the proposed Haile Gold Mine Mitigation Plan, are discussed below.

3.1 Objectives

The objectives of the mitigation plan are to provide preservation and protection of outstanding aquatic resources. Haile has, with the assistance of the various state and federal agencies and

NGO's, identified three separate sites for preservation that contain significant natural areas, unique landforms and cultural resources, including, outstanding aquatic resources capable of providing environmental benefits on a watershed and regional scale. The sites are summarized below and illustrated in *Figure 1*:

Site 1: The Rainbow Ranch Site is 698 acres containing 19,714 LF of streams and 28.11 acres of wetlands.

Site 2: The Cooks Mountain Site is 1,131.8 acres, containing 28,292 LF of streams, 10,289 LF of Wateree River shoreline and 485.1 acres of wetlands.

Site 3: The Goodwill Plantation Site is 2,559 acres, containing 30,706 LF of streams, 29,560 LF of Wateree River shoreline and 1,048.1 acres of wetlands.

The Mitigation Plan contemplates that these sites will be preserved and managed under SCDNR's Heritage Trust Program as a Heritage Preserve in accordance with a Dedication Agreement, as provided in S. C. Code Ann. Sec. 51-17-10.

Based on resource assessments completed by Tidewater Environmental Services, Inc., EBX, Mactec, R.K. Williams and Newkirk Environmental, Inc. these sites include functional wetland and stream ecosystems and riparian areas that provide aquatic resource functions and services, including, floodwater storage, wildlife habitat and water quality protections that are important on both a watershed and regional scale. Haile's PRM Plan will protect not only the aquatic resources, but also the upland habitat on the parcels, providing wildlife benefits as well as substantial buffers to the wetlands and streams. The preservation and management of these resources as proposed will provide important physical, chemical and biological functions and contribute significantly to the ecological sustainability of their respective watersheds and downstream traditional navigable waters, as follows:

Project Exhibit

Project #: 01-3156d Date: June 2013

Created by: WW

Newkirk ENVIRONMENTAL INC.

0 3.75 7.5 15 Miles

Figure 1
Haile Gold Mine Mitigation
Site Location Map

Physical: Provides flow maintenance functions, including retention of storm water runoff, temporary storage of floodwaters and reduction of sedimentation. These functions reduce downstream peak flows during storm events as well as maintain seasonal flows in the watershed.

Chemical: Removes excess nutrients that may be contributed to the system by runoff from adjacent or upstream developed areas, reducing nitrogen and phosphorous loading downstream and preventing oxygen depletion that may result from eutrophication.

Biological: Provides habitat, travel corridors and spawning areas for various species of fish, reptiles, amphibians, birds and mammals and provides foraging and shelter for all indigenous wildlife species, including wetland dependant species.

The sites in Haile's PRM Plan will more than fully offset all impacts at Haile Gold Mine (Table 1), including those associated with possible future permit amendment or a new permit application. Additionally, the mitigation plan compensates for the temporary effects to wetlands and streams located adjacent to the project site that may result from depressurization of groundwater. While Haile will re-establish streams at the project site during reclamation, restoring aquatic functions, Haile's PRM Plan does not include those efforts. As a result, the actual contribution of the Haile project to the regional aquatic resources will be more extensive than provided in this Plan.

In addition to the figures in Table 1, other factors including location, wildlife benefits, historic and cultural values provide significant benefits to the mitigation plan. Specific details of additional value and summary tables for each site are included Section 3.4 of this report.

Table 1

Haile Impact to Mitigation Proposal Comparison									
	Total Site Acreage	**Total Wetland Acres**	**Total Stream/ River LF**	**Wetland Impact Acres**	**Stream Impact LF**	**Wetland Preservation**	**Stream Preservation**	**Upland/ Riparian Preservation**	**Total Land Preservation**
Haile	**4,552.25**	**361.20**	**100,279.22**	**120.46**	**26,460.54**				
Rainbow Ranch	**698.00**	**28.11**	**19,714**			**28.11**	**19,714**	**669.89**	**698.00**
Cooks Mountain	**1,131.80**	**485.10**	**28,292/ 10,289**			**485.10**	**38,581**	**646.70**	**1,131.80**
Goodwill Plantation	**2,559.00**	**1,048.10**	**30,706/ 29,560**			**1,048.10**	**60,266**	**1,510.90**	**2,559.00**
Total				**120.46**	**26,460.54**	**1,561.31**	**118,561**	**2,827.49**	**4,388.80**

3.2 Site Selection

Site selection of appropriate mitigation is framed by the context of the scope and complexity of the project and agency comment and input during the process encouraging Haile to explore and evaluate alternative mitigation sources centering on outstanding aquatic resources. Hand in hand with finding appropriate sites, Haile worked with the state to assure that the property would be acceptable to SCDNR's Heritage Trust Program.

The sites identified and proposed as mitigation for the Haile project have been evaluated and selected based upon criteria established by the S.C. legislature in 1976 under Section 51-17 of the S.C. Code of Laws, the Heritage Trust Program. The Heritage Trust Program was established "…to provide for the inventorying, preservation, use and management of unique and outstanding natural or cultural areas and features…" Candidate lands for consideration under the Heritage Trust Program must include:

- Significant natural areas containing relatively undisturbed ecosystems, unique landforms, threatened, endangered or unique plant or animal habitats or other unusual or outstanding scientific, educational, aesthetic or recreational characteristics; or
- Outstanding examples of historic or archaeological heritage.

Site Selection Priorities - Heritage Trust Criteria				
Undisturbed Ecosystems	**Unique Landforms**	**Protected or Unique Plant or Animal Habitat**	**Outstanding Scientific, Educational, Aesthetic or Recreational Characteristics**	**Outstanding Examples of Historic or Archaeological Heritage**

From the baseline of suitability for Heritage Trust, evaluation of potential *in-watershed* properties was conducted. On-going conservation efforts by others within the region were considered as a

factor to evaluate available appropriate sites within the watershed. Sites that would provide a "conservation corridor" by proximity to other preserves were preferred; as such locations can maximize watershed benefits. From this search, Rainbow Ranch was identified as a candidate property. Additional in-watershed properties were limited by size and availability and no other candidate properties were indentified.

Recognizing the need for additional mitigation and in coordination with the NGOs and governmental agencies, Haile extended the search to include properties *in-Ecoregion* including adjacent watersheds and HUCs. This is consistent with agency comments received on the 2011 Haile PRM plan, which recommended considering ecoregions in mitigation site selection. The location of impacts at the Haile project is in the transitional zone between the Piedmont and Southeastern Plains Level III Ecoregions and includes stream and wetland impacts within the Carolina Slate Belt and Sandhills Level IV Ecoregions. Expanding the search to the appropriate ecoregion in adjacent watersheds, mitigation sites were targeted as being outstanding resources within their respective watershed.

Finally, to these threshold criteria, each of the sites under consideration has been further evaluated based upon more specific criteria, including:

- Size and location;
- Wetlands, streams and upland habitat offered;
- Natural quality or level of disturbance of property;
- Designations of special value;
- Availability; and
- Ability to accomplish perpetual protections and management (cost).

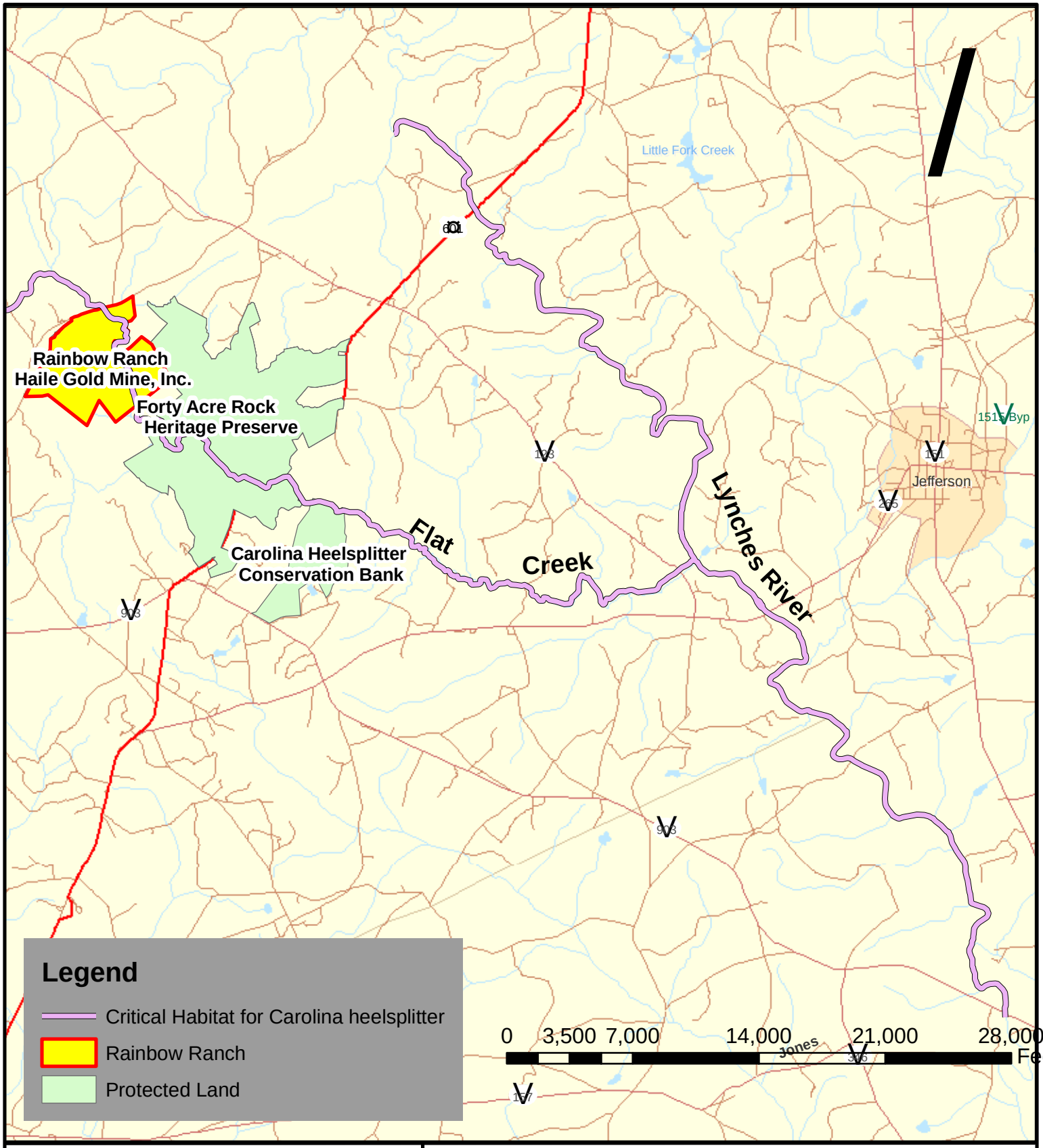
The sites selected meet all of these criteria.

1) All three of the sites fit within established criteria for the SCDNR Comprehensive Wildlife Conservation Strategy (CWCS) and include species designated as "Highest Priority".

2) All are within priority areas of the South Atlantic Migratory Bird Initiative (SAMBI) which is a vision and process of integrated bird conservation planning and implementation of the Management Board of the Atlantic Coast Joint Venture (ACJV). This Plan provides a regional scale framework for the conservation of waterfowl, shorebirds, waterbirds, landbirds, and upland game birds.

3) Two of the sites proposed as mitigation for Haile impacts, specifically Cooks Mountain and Goodwill Plantation are within the COWASEE (Congaree, Wateree, Santee) Basin Focus Area (Appendix A), a land conservation partnership, including SCDNR, United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), Ducks Unlimited, Congaree Land Trust, Richland County Conservation Commission, Friends of Congaree Swamp and Sumter County Soil and Water Conservation District. These properties have been identified as a high priority for land conservation efforts within the Wateree River Watershed. In fact, the Goodwill Plantation site was evaluated by SCDNR for inclusion in the Heritage Trust Program in 2001 and a portion of the Cooks Mountain site was placed under easement with Wetlands America Trust in 2004. The COWASEE Basin Focus Area, Defined in 2005 by the referenced partners, represents a unique opportunity to accomplish landscape scale conservation within the midlands of South Carolina.

4) The third site, Rainbow Ranch, is adjacent to the 2,267 acre SCDNR Forty Acre Rock State Heritage Preserve and includes a significant portion of Flat Creek and its tributaries, which is designated by United States Fish and Wildlife Service (USFWS) as critical habitat for the Endangered Carolina Heelsplitter (*Lasmigona decorata*) (Figure 2). Rainbow Ranch is an extremely important and high priority property for Heelsplitter conservation efforts within the Lynches River Watershed, as critical habitat established by the USF&WS in June of 1993 extends through the site both upstream and downstream.



Carolina heelsplitter Critical Habitat

Source: USFWS Critical Habitat Portal

Created by: RC

Newkirk ENVIRONMENTAL INC.

Figure 2
Carolina Heelsplitter Designated Critical Habitat & Other Protected Lands
Lynches River Watershed
Lancaster County, SC

3.2.1 Watershed and Ecoregion Threat

Analyzing development trends and threats and identifying aquatic resources in need of restoration and protection is a consideration for site selection. Potential impacts to aquatic resources within the watersheds (Lynches and Wateree) and ecoregions (Piedmont and Southeastern Plains) include development activities, sand mining, transportation, and forestry practices among others.

Figures for the years 2000 and 2010 from the US Census Bureau indicate population growth in S.C. of approximately 15.3% during the decade, with 67% of this increase due to immigration for school, jobs and retirement. S.C. actively recruits and is attractive to new and expanding industrial and commercial development interests, with relatively low labor costs and corporate taxes and excellent highway, rail and port access. The US Department of Commerce Bureau of Economic Analysis ranks SC as the 12th fastest growing state economy in the nation and tied with NC as the fastest growing state on the east coast. The SC Budget and Control Board, Office of Research and Statistics projects population growth in the state approximately 17.9% through 2030. The Lynches River and Wateree River watersheds are geographically situated in the midlands of S.C., between the urban growth and population centers of Columbia, Florence and Charlotte, N.C. The area includes three interstate highways, ten U.S. highways and various rail lines operated by CSX and Norfolk Southern. The S.C. counties within the Lynches and Wateree Watersheds (Chesterfield, Darlington, Fairfield, Florence, Kershaw, Lancaster, Lee, Richland, Sumter and Williamsburg) are expected to experience population growth of approximately 12.6% through 2030.

According to the South Carolina Department of Natural Resources (SCDNR) Comprehensive Wildlife Conservation Strategy, Pliocene and Pleistocene sands form the top layer of the Sandhills Ecoregion. These sands are very pure and a high quality source of silica. A conservation concern for SCDNR is the threat that sand mining creates for aquatic resources in the Sandhills Ecoregion. As stated in SCDNR's Comprehensive Wildlife Conservation Strategy,

> "Sand mining operations have been initiated or are ongoing in the main-stem or riparian areas of many Southeastern Plains rivers. In-stream sand mining is a significant threat to aquatic resources within the ecoregion. Sand mining not only causes bank stability problems

> and loss of riparian areas at the mining site; within the stream, this activity adversely affects physical and chemical habitat and can negatively affect biological communities and recreational uses" (Nelson 1993).

Silviculture is also an economically viable land use for the Haile PRM plan sites. South Carolina uses a voluntary Best Management Practices (BMPs) system for silviculture. Though there is generally good adherence to BMPs by the professional forestry community, the BMP buffer recommendations are significantly less than can be provided under Heritage Trust levels of protection. Reliance on voluntary forestry BMPs can result in unprotected streams because the BMPs do not apply if the land is converted to another use. In this case, local zoning ordinances would be needed to protect additional buffers to streams or wetlands, but these do not exist. Under the Haile PRM Plan, all of the vegetated uplands, not merely a buffer zone, would be preserved.

Stream and wetland areas located in the Southeastern Plains ecoregion are under similar threats from silviculture and agriculture. The area is subjected to additional pressures due to the soil type. As stated in SCDNR's Comprehensive Wildlife Conservation Strategy:

> "Forest clearing, soil tilling and channelization in the vicinity of Southeastern Plain streams have resulted in streams that are heavily silted. Modern soil conservation practices and lower potential for channelization have reduced those impacts, but sedimentation from non-point and point sources remains a significant detriment to streams. Development activities, agriculture and silviculture are primary sources of erosion that lead to sedimentation in streams. Corporate and private timber managers that fail to follow best management practices (BMPs) contribute to siltation and other non-point source pollution within the ecoregion. Stream bank erosion due to loss of riparian areas, livestock grazing, and altered hydrology also contribute to sedimentation in streams."

The 2008 Mitigation Rule recognizes that buffers to aquatic resources are of value as mitigation at 33 C.F.R. 332.3(i). The Charleston Guidelines also acknowledge that protection of streams and wetlands by establishing adjacent buffers is important to maintain the integrity of the aquatic

systems, "…forested riparian zones are essential to stream system function, channel stability, and maintenance of water quality and in-stream habitat." Additionally, a study conducted by the Wetlands Regulatory Assistance Program, US Army Research and Development Center (ERDC-TN-WRAP-01-06, May 2002) (Appendix B) determined that buffers adjacent to aquatic resources provide physical and ecological functions and "are a critical element of the overall aquatic ecosystem in virtually all watersheds".

For the mitigation areas presented herein, there is no state or county ordinance that requires maintenance of minimum buffers around stream channels or wetlands. Protection of streams and wetlands by establishing not only adjacent buffers, but in this instance preservation of large upland areas, contribute significantly to the sustainability of the watershed.

3.2.2 Watershed and Ecoregion Evaluation and Need

The Wateree and Lynches River watersheds and Southeastern Plains and Piedmont Ecoregions have several features to be considered when selecting mitigation sites, which can assist in meeting regional and watershed needs.

1) The largest designated Total Maximum Daily Load (TMDL) for the Pee Dee Basin (030402) is located in the headwaters of the Lynches River watershed.
2) Critical Habitat for the Federally-Listed Endangered species (Carolina Heelsplitter mussel) is located in the Lynches River watershed.
3) SCDHEC Section 303(d) List of Impaired Waters (May 24, 2012) (Appendix C) include the Wateree River both upstream (DHEC Station CW-214) and downstream (CW-206) of the Cooks Mountain and Goodwill Plantation sites, Colonels Creek upstream of Goodwill Plantation (CW-250), Flat Creek downstream of the Rainbow Ranch site (PD-182,Rs-08233) and Lynches River downstream of Rainbow Ranch (PD-071, PD-364. PD-041, PD-624 and PD-048).
4) Sandhills wetland/stream headwater systems are natural resources that the commenting agencies have indicated are under significant threat (Rohde, 1991)

5) Within the Sandhills Level IV Eco-Region reside multiple species of highest priority conservation concern. The list includes 2 crawfish species, 3 fish species including Sandhills chub, and 19 mussel species (73% of the total mussel species listed in the state).
6) The Lynches River watershed contains two high priority conservation areas;
    a. Forty Acre Rock Heritage Preserve located in the watershed of the impact site
    b. Sandhills National Wildlife Refuge
7) The Wateree River Watershed includes the COWASSE Basin Focus Area, one of only twelve such conservation efforts in South Carolina.

In consideration of watershed and ecoregion needs, the Haile PRM plan offers the following benefits that respond to particular needs:

1) Stream, wetland and buffer preservation on sites which improve water quality within areas of concern (TMDL and 303d) and contribute to the sustainability of respective watersheds;
2) stream and riparian preservation and enhancement by preservation of upland buffers and riparian corridors for the benefit of the Carolina Heelsplitter mussel habitat;
3) preservation and enhancement by upland buffers of Sandhills stream and wetland headwaters for the benefit of the Sandhills chub and other species habitat;
4) importance and supplement to existing conservation lands and regional conservation efforts and;
5) cultural resources preservation.

3.3 Site Protection

It is proposed and intended that the identified mitigation sites be held in the fee simple ownership of SCDNR and the Heritage Trust Program. The Heritage Trust Program is a system dedicated to inventorying, preserving, using and managing "outstanding natural or cultural areas and features" in South Carolina.[1] Properties generally enter the Heritage Trust Program through dedication.[2] Dedication occurs through acquisition, which is fee simple transfer of the property, or acceptance, which is a

1 S.C. Code Ann. § 51-17-10(12) (2012).
2 *Id.* § 51-17-10(9) (2012).

transfer of less than a fee simple interest in the property such as a conservation easement.[3] Properties dedicated to the Heritage Trust Program through acquisition must be protected in perpetuity.[4] When a property is dedicated, the owner that retains any interest in the property enters into a Dedication Agreement with SCDNR that clearly states any restrictions, conditions, permissive and non-permissive uses.[5] The Dedication Agreement and any other property restrictions are recorded in the county real estate records to complete the dedication into the Heritage Trust Program.[6] Haile will work with SCDNR to arrange a fee simple interest in the mitigation sites through a Heritage Trust Program dedication that meets the objectives of this mitigation plan. Based on baseline evaluations, Rainbow Ranch, Cooks Mountain, and Good Will Plantation qualify as Heritage Trust Preserves.

In accordance with S. C. Code Ann. Sec. 51-17-80 "[t]he following restrictions shall apply to all Heritage Preserves":

> The primary dedication as a Heritage Preserve shall be to preserve and protect the natural or cultural character of any area or feature so established. The board of the department and its agents shall in all cases maintain the essential character of any area or feature dedicated, and as such they are hereby declared to be at their highest, best and most important use for the public benefit. No Heritage Preserve shall be taken for any other public purpose unless the approval of both the board of the department and the Governor has been obtained. In no case shall any Heritage Preserve be taken for any private use.

Haile will work with SCDNR and the USACE to establish appropriate conditions on the fee simple transfer of the entire sites to the SCDNR to satisfy these requirements.

3.4 Baseline Information

3.4.1 Haile Gold Mine Site

3.4.1.1 Location and Landscape Position

The Site is located three miles northeast of the town of Kershaw in southern Lancaster County, South Carolina (Latitude 34.579810° North, Longitude -80.539554° West). The Site consists of 4,552.25 acres of land; the portion west of Hwy 601 is approximately 1,626.90

3 *Id.*
4 *Id.* at § 51-17-80 (2012).
5 *Id.*
6 *Id.*

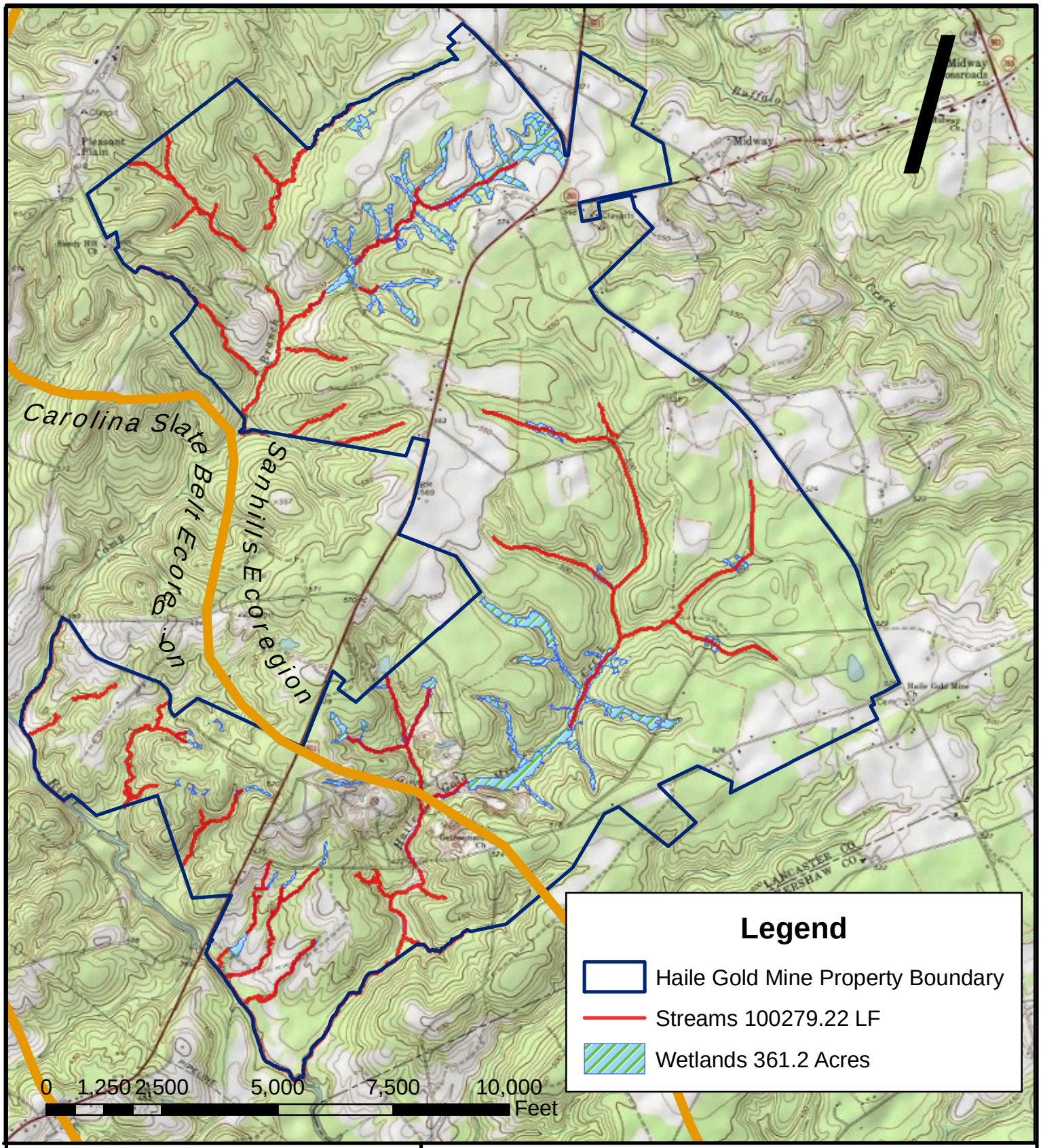
acres and the portion east of Highway (Hwy) 601 is approximately 2,925.35 acres (see Figure 3). The Site is entirely privately owned by Haile Gold Mine, Inc.

The Site is located primarily within the Southeastern Plains (Level III)-Sandhills (Level IV) Ecoregion with the southern portions of the Site located within the Piedmont (Level III)-Carolina Slate Belt (Level IV) Ecoregion. The Site is located within the Lynches River Watershed -HUC 03040202. The primary drainage through the western portion of the Site is Camp Branch which flows from the northwest Site boundary approximately two miles southwest to the confluence of Little Lynches River. The primary drainage through the central portion of the Site is Haile Gold Mine Creek which flows from the northeast, southwest into Little Lynches River. Little Lynches River borders the southern portion of the Site, on both sides of Hwy 601, flowing from west to southeast. Little Lynches River flows to the Lynches River; the confluence of the Little Lynches and the Lynches River is approximately 25 miles downstream from the confluence of Haile Gold Mine Creek and the Little Lynches River.

The Site is characteristic of the region with rolling hills and low lying drainages. Vegetation community types vary across the Site consisting of natural and managed deciduous and coniferous forests, cleared and logged lands as well as communities of successional regeneration and reclaimed land.

Average elevation is approximately 450 feet above mean sea level varying from approximately 360 feet in the lower drainages to a maximum elevation of 620 feet on the upland hills.

The portion of the Site east of Hwy 601 has been affected by past mining operations. Mining has occurred on the Site dating back to as early as 1827 with more modern mining operations occurring through the mid-1990. Mining operations have been inactive since this time and portions of the Site reclaimed. Much of the topography, physical features, drainages and wetlands have been altered, influenced or affected by past mining operations.



Wetland Field Exhibit

Project #: 01-2968a Date: August 2011

Created by: WW

Newkirk ENVIRONMENTAL INC.

Figure 3
Haile Gold Mine Inc.
HUC 03040202
EPA Level IV Sand Hills and Carolina Slate Belt Ecoregions
Lancaster County, SC

A network of mine access roads fragment wetland and upland habitats on the southern portion of the Site while remaining upland habitats have been clear-cut for timber.

3.4.1.2 Aquatic Resources

Wetland and stream delineation was approved by the USACE in September 2012. In total, 361.20 acres of aquatic resources (i.e., wetland and streams) and other water features were identified and mapped on the Site. Of the total mapped habitat, 337.71 acres is considered jurisdictional wetland/waters of the US; and 23.49 acres is considered to be non-jurisdictional abandoned pit lakes, sediment basins/treatment ponds or wetland areas. Of the 337.71 acres of total jurisdictional habitat, 294.09 acres is jurisdictional wetland, 31.25 acres is jurisdictional waters of the US and 12.37 acres is impoundment of jurisdictional waters of the US. Non-jurisdictional habitat consists of 17.05 acres of non-wetland water features and 6.44 acres of non-jurisdictional wetland. Refer to Figure 3 for jurisdictional and non-jurisdictional habitats on the Site.

Jurisdictional wetlands on the Site occur as 1) wetlands directly contiguous to perennial RPWs; 2) wetlands directly contiguous to seasonal and non-RPWs and 3) wetlands adjacent to perennial RPWs. Jurisdictional non-wetland water features on the Site occur as perennial, seasonal and non-RPWs. The jurisdictional waters identified on Site ultimately flow directly into the Lynches River via Little Lynches River, both of which are characterized by well-defined channels with OHWM and defined bed and banks. From the Site, Little Lynches River flows Approximately 25 miles to its confluence with Lynches River, this then flows into the Great Pee Dee River.

Aquatic resources within the Site include and are classified as (detailed descriptions are included within the Jurisdictional Determination and Permit Application):

Haile Gold Mine – Aquatic Resources	
Wetlands	**Streams**
Cowardin Classification	**Order**
PFO1B	1st Order
PFO1C	2nd Order
PFO1F	3rd Order
PFO1H	4th Order
PSS1C	
PSS1Hh	
PEM1C	
PSS1/POWHb	
PEM1/ POWHb	

3.4.1.3 Upland Resources and Vegetation

In total, 4,191.05 acres of upland habitat are located on the Site. Generally, uplands throughout the Site are characterized by dry sandy hillsides, much of which have been timbered, in successional regeneration or are in planted pine production. Generally these areas have been recently cleared and/or may be dominated by such species as loblolly pine *(Pinus taeda),* white oak *(Quercus alba),* post oak *(Quercus stellate),* blackjack oak *(Quercus marilandica),* dewberry *(Rubus fragellaris)* and American beech *(Fagus grandifolia).* Additional uplands are located in topographically lower areas and along the bottom of hillsides. These areas tend to exhibit slightly higher percentage of hydrophytic vegetation but lack hydric soil and hydrology indicators associated with wetlands. Generally these areas are dominated by forest communities consisting of red maple, sweetgum *(Liquidambar styraciflua),* and American holly, (*Ilex opaca).*

3.4.2 Rainbow Ranch Site

3.4.2.1 Location and Landscape Position

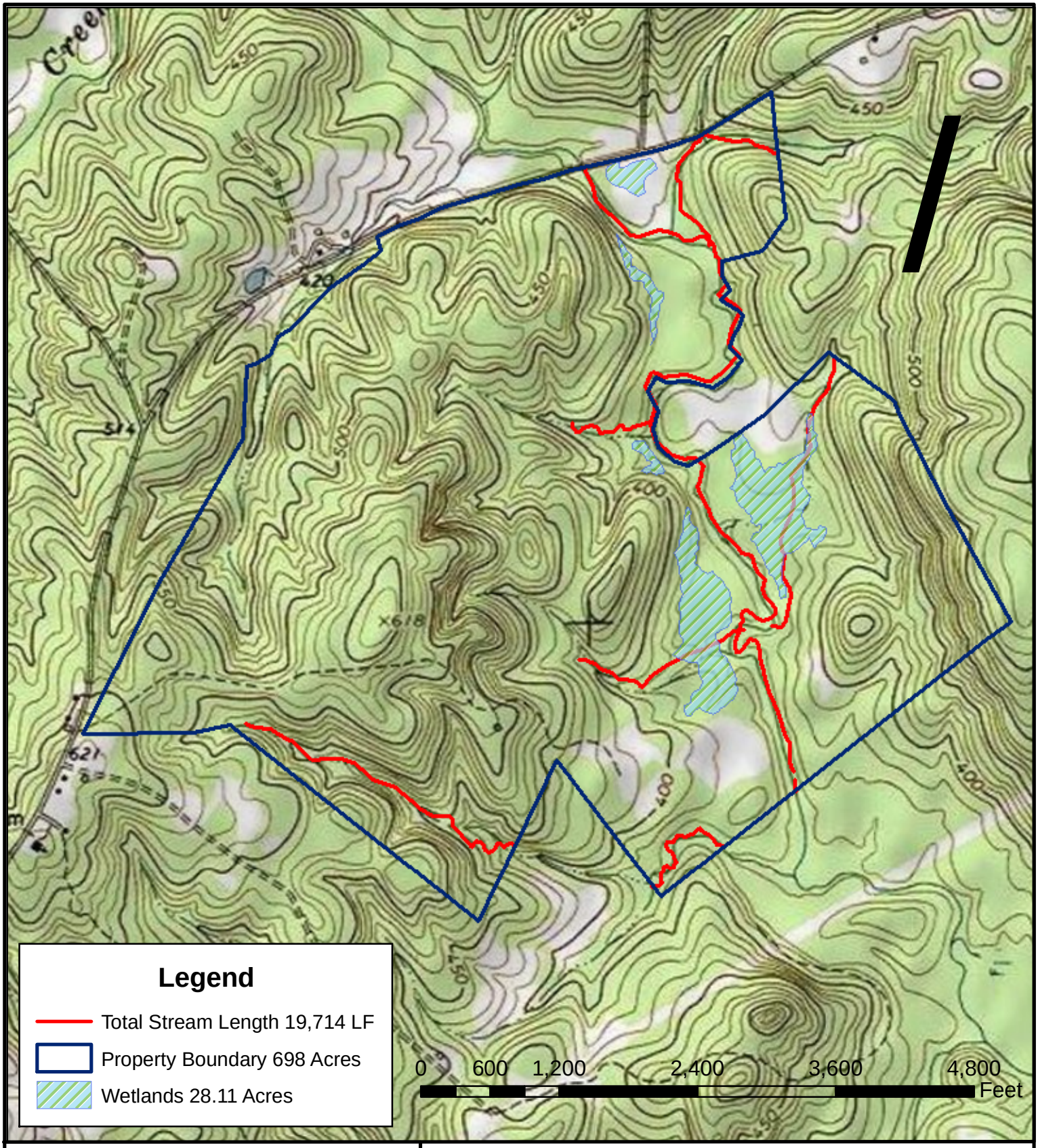
The Rainbow Ranch Site is 698 acres of relatively undisturbed and functional upland (670 acres), wetland (28 acres) and stream (19,714 LF) ecosystems located within the EPA Level III Piedmont and Level IV Carolina Slate Belt Ecoregion and the Lynches River Watershed (HUC 03040202) in Lancaster County.

The property is adjacent to the 2,267 acre SCDNR Forty Acre Rock Heritage Preserve. A portion of Flat Creek, which was established as designated critical habitat for the endangered Carolina Heelsplitter by USFWS in 1993, bisects the property (Appendix D). The Rainbow Ranch Site represents approximately 2.4% of the Flat Creek Watershed. The Site is also upstream of the established Carolina Heelsplitter Conservation Bank. Together these three properties will provide protection to 5 miles (26,367 LF) of the designated critical habitat for the Carolina Heelsplitter.

3.4.2.2 Aquatic Resources

In total, 28 acres of wetlands and 19,714 LF of stream are mapped on the Site (Mactec, 2011 and EBX, 2011) (Figure 4 and 4a). All of the aquatic resources are in a relatively undisturbed state relative to passive recreational use.

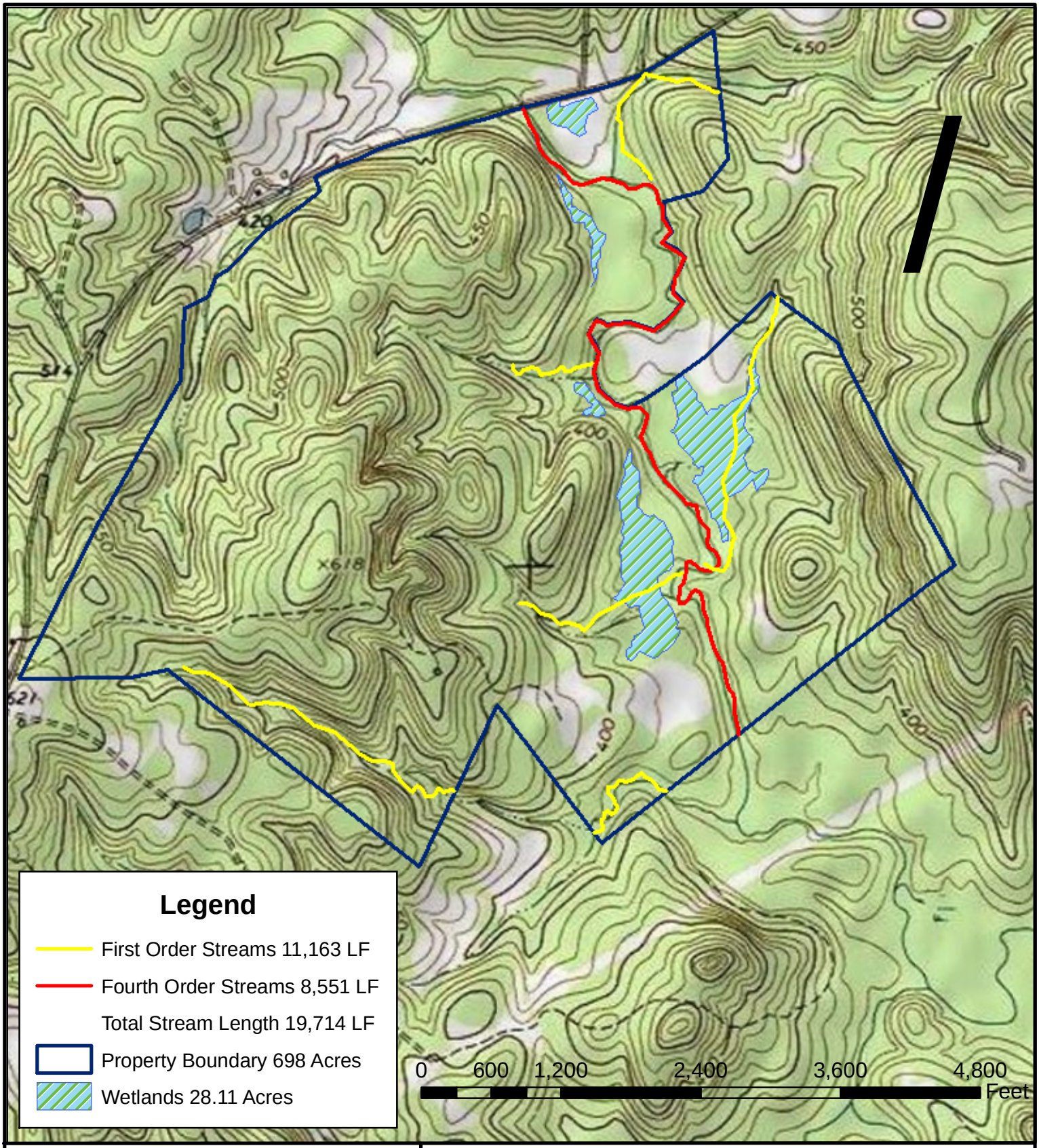
Rainbow Ranch – Aquatic Resources	
Wetlands	**Streams**
Cowardin Classification	**Order**
PSS1C	1st Order
PSS1A	4th Order
PEM1A	
PFO1A	
PEM1/PSS1A	



Wetland Field Exhibit	
Project #: 3156-d Date: June, 2013	
Created by: WW	

Newkirk ENVIRONMENTAL INC.

Figure 4
Rainbow Ranch Property
HUC 03040202
EPA Level IV Slate Belt Ecoregion
Lancaster County, SC



Wetland Field Exhibit	
Project #: 3156-d Date: June, 2013	
Created by: WW	
Newkirk ENVIRONMENTAL INC.	

Figure 4a
Rainbow Ranch Property
HUC 03040202
EPA Level IV Slate Belt Ecoregion
Lancaster County, SC

Flat Creek flows SSE for approximately 1.63 miles from the northeast border of the Site near the intersection of Rainbow Ranch Rd and Overbrook Rd. to the southeast property boundary. An unnamed tributary drains the northeast corner of the Site flowing approximately 0.35 miles south into Flat Creek. An approximately 0.17 mile unnamed tributary converges with Flat Creek in the central eastern portion of the Site. Flowing SSW through the eastern most wetland on the Site, an approximately 0.49 mile unnamed tributary joins Flat Creek. Another approximately 0.32 mile unnamed tributary flows ENE into Flat Creek. The southern border of the Site transects an approximately 1 mile unnamed tributary flowing east into Flat Creek. Flat Creek ultimately converges with Lynches River approximately 6.13 miles to the ESE of the site.

Wetlands occur along the floodplain of Flat Creek and numerous perennial and intermittent streams drain from the upland hills to Flat Creek. Vegetation within the wetlands is characterized as a mature mixed hardwood community. Dominant species include yellow poplar (*Liriodendron tulipifera*), red maple (*Acer rubrum*), sycamore (*Platanus occidentalis*), green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*) and sweet gum (*Liquidambar styraciflua*). Ground cover is sparse due to the

closed canopy but includes giant cane (A*rundinaria gigantea*) and Christmas fern (*Polystichum acrostichoides*).

Hydrology of the floodplain area is derived from a combination of continuous hydrologic inputs from the streams and ground water seepage flowing from the adjacent upland slopes and occasional flood events from Flat Creek.

3.4.2.3 Upland Resources and Vegetation

Uplands within the Site are a mature Oak – Hickory Forest located on elevated slopes and hills contiguous to Flat Creek, on site streams and the Flat Creek Floodplain. Dominant species in the canopy include mockernut hickory (*Carya tomentosa*), pignut hickory (*Carya glabra*), white oak (*Quercus alba*) and northern red oak (*Quercus rubra*). Other species occurring in the canopy and understory include flowering dogwood (*Cornus florida*), hornbeam (*Carpinus caroliniana*), shagbark hickory (*Carya ovata*), beech (*Fagus grandifolia*) and Eastern red cedar (*Juniperus virginiana*). Loblolly pine (*Pinus taeda*) is present on some ridge tops and gently sloping hillsides. Sparse groundcover includes ebony spleenwort (*Asplenium platyneuron*) and woodoats (*Chasmanthium latifolium*).

3.4.2.4 Cultural Resources

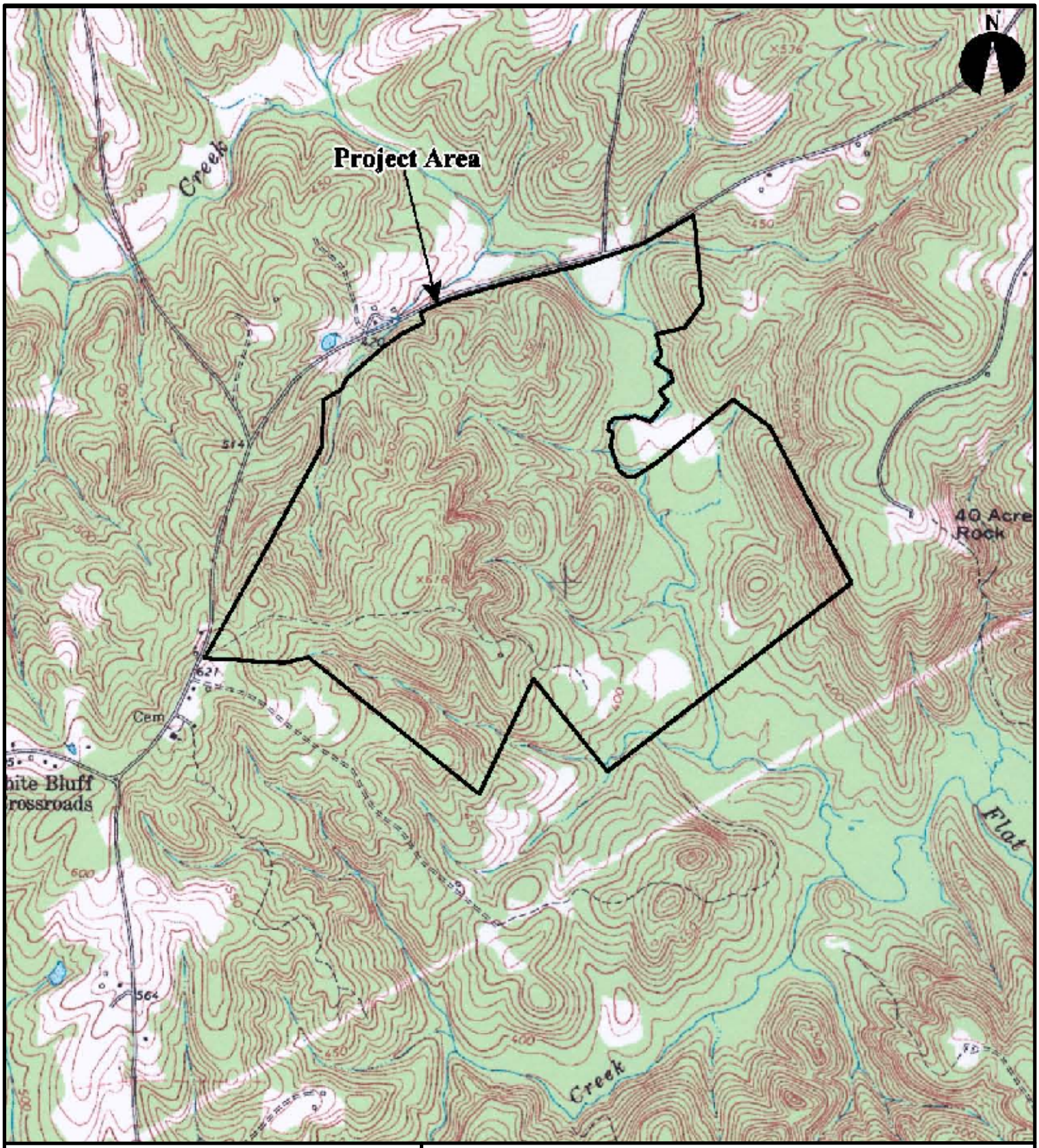
The Rainbow Ranch property contains no recorded sites either listed or eligible for listing on the NRHP (Figure 5). A search of the ArchSite database by R.S. Webb and Associates (Appendix F) did not identify any cultural or historic resources recorded within Rainbow Ranch. According to R.S. Webb and Associates, the site would have been suitable for pre-historic and historic human occupation and the lack of recorded resources is probably due to the lack of a comprehensive and systematic survey of the property.

3.4.2.5 Wildlife Resources

The location of Rainbow Ranch and diversity of mature communities supports a wide variety of native wildlife. Of particular note for this Site is the Carolina heelsplitter (*Lasmigona decorata*). The Carolina heelsplitter is a federally listed endangered freshwater mussel species with 11 extant populations within the following river basins: Savannah River Basin (Cuffytown and Turkey creeks), Santee Cooper River Basin (Rocky Creek, Fishing Creek, Gills Creek, Waxhaw Creek, Cane Creek, Red Bank Creek, and Six Mile Creek), and Pee Dee River Basin (Lynches River and Goose Creek). Each population is small, isolated, and highly vulnerable to extirpation.

Freshwater mussels are among the most threatened groups of organisms in North America. There are nearly 300 recognized species and subspecies in the United States, and 189 of them are currently on the IUCN Red List (Lydeard et al. 2004). At least 30 species are presumed extinct. A panel of experts from the southeast concluded that only three of 33 native mussel species in South Carolina are stable and abundant enough not to be included as conservation priority species. (CWCS, 2005)

The conservation of North American freshwater mussels has many broad implications beyond the survival of individual mussel species. As filter-feeders, mussels clean the water of suspended particles and can improve water quality. They are also important food sources for fish, waterfowl, turtles, muskrats, raccoons and river otters. In general, mussels are quite sensitive to pollutants and are recognized as indicator species; they are often the first to decline when streams and rivers become polluted. Protection and



Map Taken From R.S. Webb & Associates

Project #: 01-3156d Date: June 2013

Created by: RC

Newkirk ENVIRONMENTAL INC.

Figure 5
Cultural Resources Map of
Rainbow Ranch Mitigation Tract
(No Previously Recorded Cultural Resources Present)

restoration of freshwater ecosystems to support a diverse mussel fauna will also result in improving the health of these ecosystems, to the benefit of other aquatic organisms and humans. (SCDNR CWCS)

A second species of interest for Rainbow Ranch is the Sandhills Chub (*Semotilus lumbee*) which is a state listed species of concern native to streams and primarily headwater streams within the Carolina Sandhills Ecoregion of North and South Carolina. A study conducted by Fred C. Rohde and Rudolf G. Arndt in 1991 (Appendix E) identified the chub in the Lynches River Watershed. While the Rainbow Ranch site and the majority of Flat Creek are located within the Carolina Slate Belt Ecoregion, Flat Creek is a significant tributary to the Lynches River. Conservation efforts that protect Flat Creek throughout its drainage will benefit downstream water quality to the benefit of the chub and other species.

3.4.2.6 Threat

The threat of adverse impact to the Site from typical residential or commercial development activities is low; however, potential adverse effects from silviculture, agriculture, mining activities or industrial development exist for a land site of this size and location. The Site is accessible from SSR 37 (Overbrook Road) and is currently zoned R45A, Rural Residential/Intense Agricultural District in Lancaster County, which provides for low density residential, low intensity commercial and high intensity agricultural. Considering the sensitivity of Flat Creek, including the downstream protected waters, any level of disturbance is a potential threat to water quality and the critical habitat. Silviculture and agricultural affect to water quality from sedimentation or livestock use is commonly acknowledged as an adverse impact.

As seen in many Piedmont creeks in North and South Carolina, the upper reaches of Flat Creek are presently down cutting through accumulated sediments produced by past agricultural and silvicultural land uses. Long term landscape conservation throughout the Flat Creek Sub basin will help accelerate this process toward having stable creek banks throughout the sub basin. (Alderman, 2007)

3.4.2.7 Mitigation Priority Summary

Rainbow Ranch – Heritage Trust Criteria				
Undisturbed Ecosystems	**Unique Landforms**	**Protected or Unique Plant or Animal Habitat**	**Outstanding Scientific, Educational, Aesthetic or Recreational Characteristics**	**Outstanding Examples of Historic or Archaeological Heritage**
Wetlands, Streams, Floodplain, and Uplands	Granite Outcropping	Designated Critical Habitat for Carolina Heelsplitter	Yes	Potential

The opportunity to expand the protected habitat and management for the Carolina Heelsplitter establishes the Rainbow Ranch Site as a unique property and a high priority for acquisition and preservation within the Lynches River Watershed. The Rainbow Ranch Site is currently owned by Haile and transfer of title to the Heritage Trust Program is a practicable and achievable goal. The perpetual preservation and management of this property under the Heritage Trust Program will insure the appropriate long term management of these aquatic resources and riparian areas, providing important and significant water quality functions and services and contributing to the sustainability of the Lynches River Watershed. Furthermore, this tract of land when combined with the Forty Acre Rock Heritage Preserve will increase the size of the Preserve by over 30%.

3.4.3 Cooks Mountain Site

3.4.3.1 Location and Landscape Position

The Cooks Mountain Site is 1,131.8 acres of relatively undisturbed and functional upland (647 acres), wetland (485 acres), stream (28,292 LF) and river (10,289 LF) ecosystems located within the EPA Level III Southeastern Plains and Level IV Sandhills/Southeastern Floodplains and Low Terraces Ecoregion and Wateree River Watershed (HUC 03050104) in

Richland County. The subject property is located on the east side of US Hwy. 601; the north side of US Hwy. 378, and on the west side of the Wateree River, Eastover, Richland County, South Carolina.

Cooks Mountain consists of two (2) parcels made up of approximately 1,101.05 acres, more or less (subject to a conservation easement), and approximately 30.75 acres, more or less (open to development). The smaller parcel, 30.75 acres, is physically located within the interior of the larger parcel, 1,101.05 acres.

The unique feature of the site is its high bluff view rising approximately 260 feet above the Wateree River. This elevation change is very steep on its eastern side, facing the Wateree River, and provides scenic and panoramic views of the Wateree River and Wateree River swamp. This elevation change and view is similar to those found in the foothills and mountain areas of the state and unparalleled within this ecoregion.

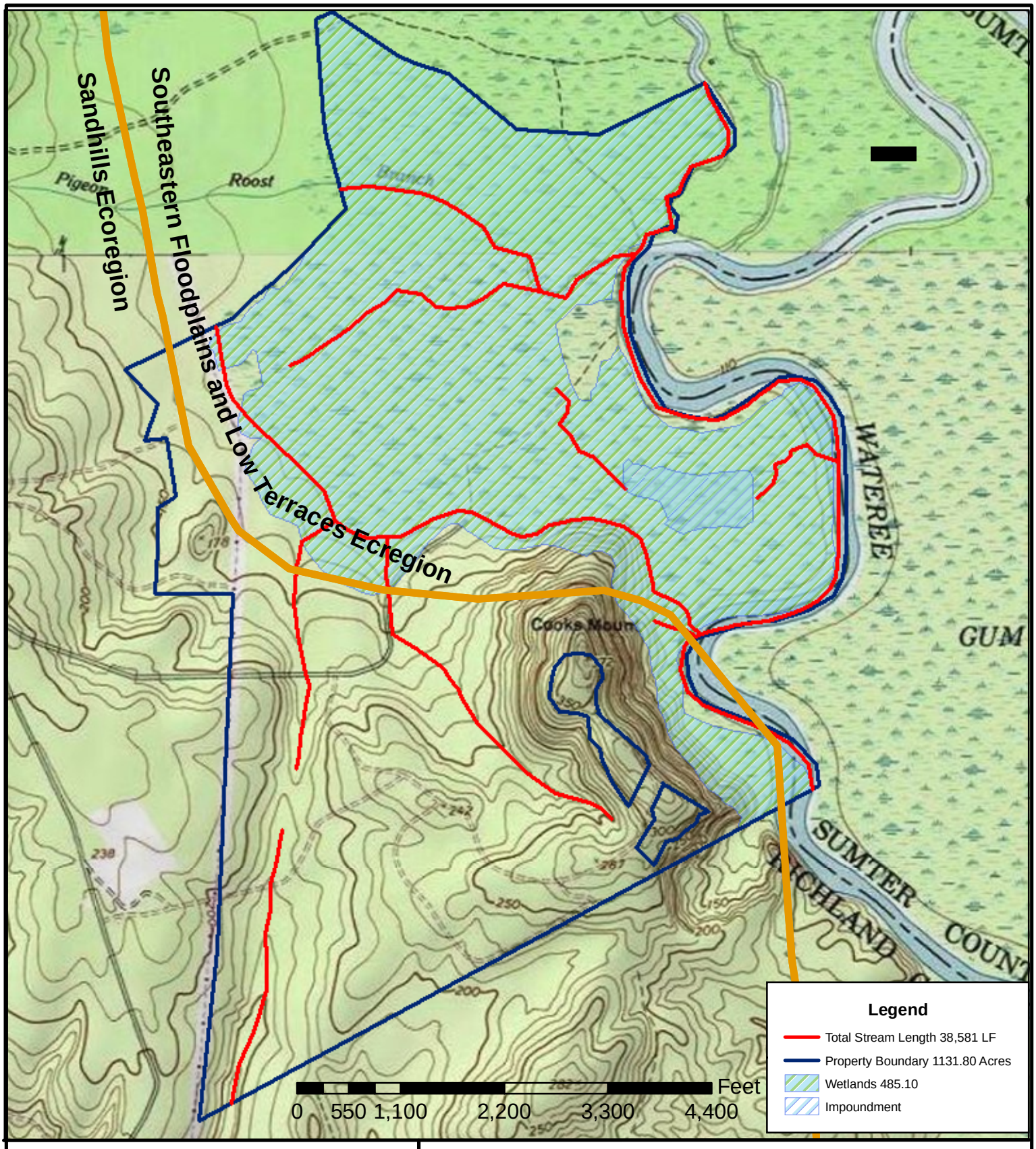
Stream and wetland resources are primarily located in the northeastern portion of the site, near the Wateree River and Spears Creek. The southern portion of the site is characterized by high Sandhill ridges. Gum and cypress swamps, and small tributaries, located at the base of Cooks Mountain, are intact and functional.

3.4.3.2 Aquatic Resources

In total, 485 acres of wetlands, 28,292 LF of stream and 10,289 LF of river are mapped on the site (Tidewater Environmental Services, Inc., 2013 and Cooks Mountain Easement Documentation Report, December 2004) (Figure 6 and 6a). All of the aquatic resources are considered functional and in an undisturbed state relative to passive recreational use.

Cooks Mountain – Aquatic Resources	
Wetlands	**Streams**
Cowardin Classification	**Order**
PFO1A	1st Order
PFO1C	2nd Order
PSS1B	4th Order
PFO1/4B	
PFO1B	
PFO1/2F	
PUBFX	
PSS1C	

The most northeastern border of the Site is formed by Spears Creek, flowing approximately 0.37 miles south into the Wateree River. The primary drainage for the northeastern portion of the site is approximately 0.58 miles of an unnamed tributary flowing into the lower 0.72 miles of Pigeon Roost Branch, ultimately draining into the Wateree River. The central drainage of the Site is created by the convergence of three unnamed tributaries. The primary tributary flows southeast for approximately 1.38 miles being joined by two north and



Wetland Field Exhibit

Project #: 3156d Date: June 2013

Created by: WW

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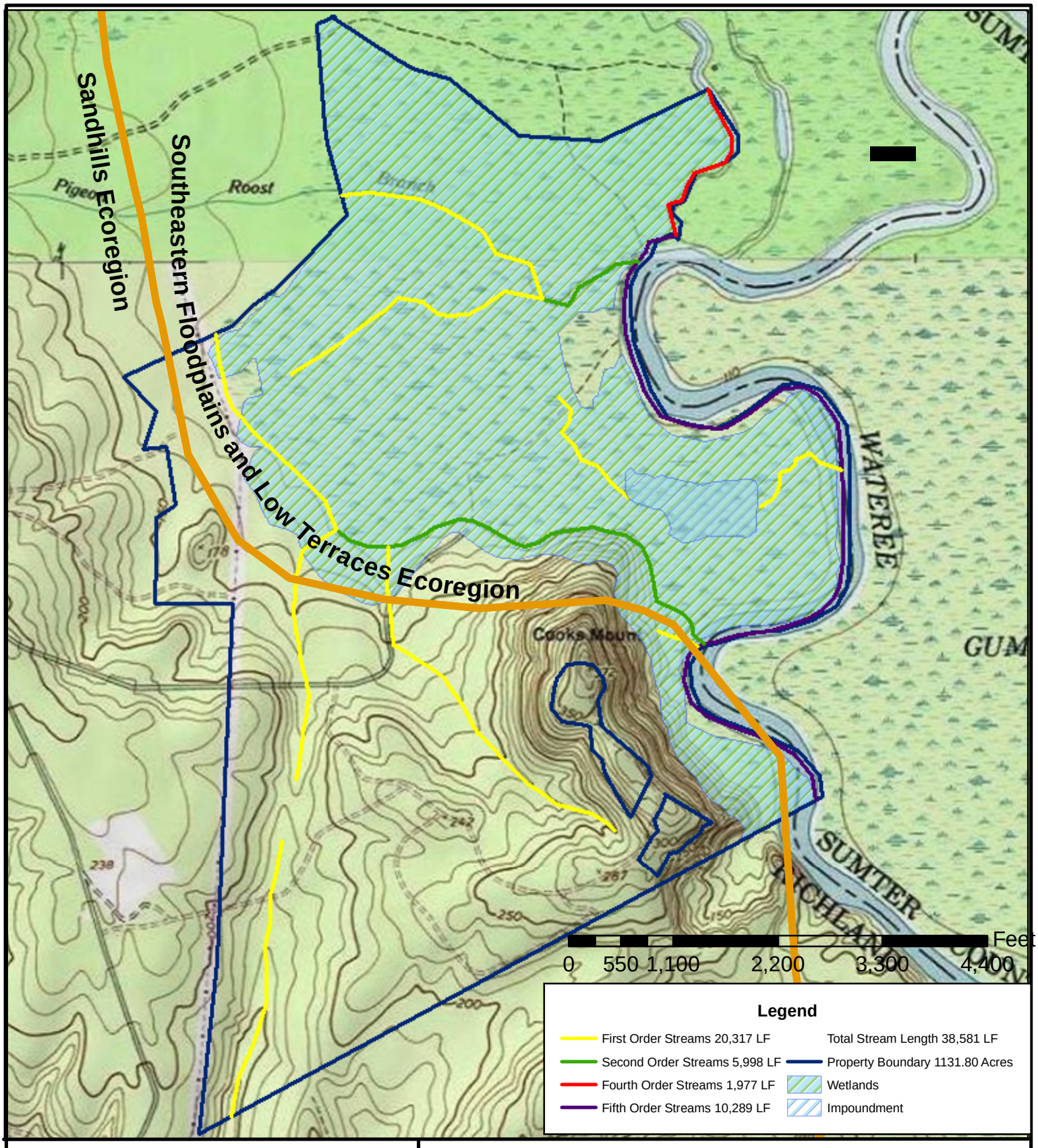
Figure 6
Cooks Mountain
HUC 03050104
Level IV Sandhills and Southeastern Floodplains and Low Terraces Ecoregions
Richland County, SC



Wetland Field Exhibit

Project #: 3156d Date: June 2013

Created by: WW

Newkirk ENVIRONMENTAL INC.

Figure 6a
Cooks Mountain
HUC 03050104
Level IV Sandhills and Southeastern Floodplains and Low Terraces Ecoregions
Richland County, SC

northeastern flowing unnamed tributaries of approximately 0.54 miles and approximately 0.79 miles respectively. The southeastern section of the site is drained by an unnamed tributary flowing approximately 1.16 miles to Colonels Creek, ultimately draining into the Wateree River 2.64 miles southeast of the tributary transecting the property boundary.

Wetlands occur along the Wateree River, Spears Creek and Pigeon Roost Branch.

Hydrology of the wetlands is derived from a combination of continuous hydrologic inputs from the streams and ground water seepage flowing from the adjacent upland slopes and occasional flood events.

A well-developed canopy within the wetlands and adjacent upland ecotones contains sweetgum *(Liquidambar styraciflua),* overcup oak *(Quercus lyrata),* water oak *(Q. nigra),* laurel oak *(Q.laurifolia),* willow oak *(Q. phellos),* swamp chestnut oak *(Q. michauxii),* cherrybark oak *(Q. pagoda),* American elm *(Ulmus americana)* and ashes *(Fraxinsus spp.).* (Williams, 2004)

Several managed wetlands are present and provide supplemental food resources for wintering waterfowl and are managed by gravity flow waters from the surrounding swamps or from the Wateree River.

These wetlands support a diverse community of shrubs, herbs and aquatic plants. There are sporadic occurrences of swamp tupelo *(Nyssa biflora)* and shrubs include tag alder *(Alnus serrulata),* wax myrtle *(Morella cerifera),* buttonbush *(Cephalanthus occidentalis),* black willow *(Salix nigra)* and sweetbay *(Magnolia virginiana),* most of which are growing on hummocks within the ponds.

3.4.3.3 Upland Resources and Vegetation

Uplands within the site contain the following types: Mixed Pines, Mixed Hardwood Forests, Planted Loblolly Pines, Natural Regeneration Pines and Agricultural Fields and Wildlife Openings.

A rich diversity of plant species is present within the hardwood forests. Diversity increases toward the bottom of each slope due to the increase in soil moisture levels and soil fertility due to the accumulation of nutrient-rich organic material washed down the slopes during rainfalls. The dominant hardwoods component is very similar to the pines-mixed hardwoods forests and includes sporadic occurrences of shortleaf pines *(P. echinata)* and loblolly pines *(P. taeda).* Dominant hardwoods include southern red oak *(Quercus falcata),* water oak *(Q. nigra),* white oak *(Q. alba),* black oak *(Q. velutina),* post oak *(Q. stellata),* sweetgum *(Liquidambar styraciflua),* yellow poplar *(Liriodendron tulipifera),* winged elm *(Ulmus alata),* American elm *(U. americana),* black cherry *(Prunus serotina)* and pignut hickory *(Carya glabra).* (Williams, 2004)

3.4.3.4 Cultural Resources

The Cooks Mountain property contains no recorded sites either listed or eligible for listing on the NRHP, although Goodwill Plantation abuts the southernmost boundary. A search of ArchSite database by R.S. Webb and Associates identified one resource within the Cooks

Mountain property (Figure 7). The identified resource is Cooks Mountain, a prominent natural/geologic feature at ±400' elevation adjacent to the Wateree River. Cooks Mountain is important historically as it was a landmark for early travelers and explorers to the area. According to Webb, the site would have been suitable for prehistoric and historic occupation and the lack of additional recorded sites is likely due to a lack of a comprehensive or systematic survey being conducted for the Cooks Mountain property.

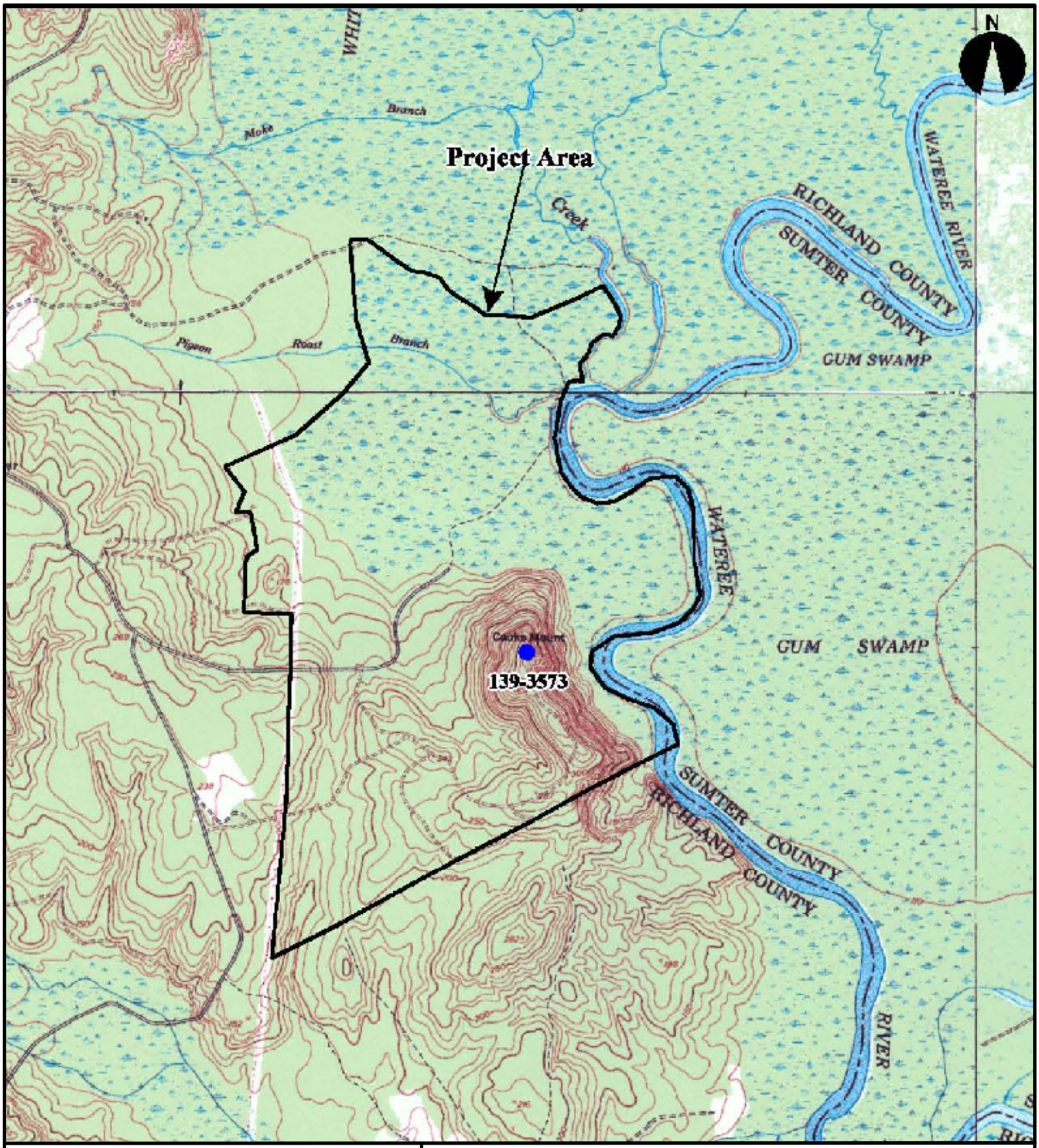
3.4.3.5 Wildlife Resources

The forested wetlands provide valuable habitat for many species of mammals, avians, reptiles, amphibians, crustaceans, insects and spiders. Many of the species of mammals, birds and reptiles listed in the section on wildlife values of forested uplands also benefit greatly from associated forested wetlands.

Amphibians found in the forested wetlands include the southern leopard frog *(Rana pipiens sphenocephala),* the southern cricket frog *(Acris gryllus),* the green treefrog *(Hyla cinerea)* and the spring peeper *(Hyla crucifer).*

The wood duck (Aix *sponsa)* regularly nests in natural cavities of bottomland hardwoods and cypress-tupelo swamps. Wood ducks also feed extensively within these systems throughout the year and can be observed feeding on acorns around the perimeter of these wetland systems. The American woodcock *(Philohela minor)* regularly probes in the soft soils and leaf litter of bottomland hardwoods for its foods. The cypress-tupelo swamps also provide excellent nesting habitat for such avians as the anhinga *(Anhinga anhinga)* and the great blue heron *(Ardea herodias),* as well as, other waterbirds that prefer to nest over standing water.

Feeding and bedding areas are adequate for white-tailed deer (Odocoileus *virginianus),* bobcats *(Lynx rufus),* gray foxes *(Urocyon cinereoargenteus),* opossums *(Didelphis marsupialis),* raccoons *(Procyon lotor),* gray squirrels *(Sciurus carolinensis),* fox squirrels *(S. niger)* and cottontail rabbits *(Sylvilagus floridanus).* Many small mammals occur in the forested uplands, the most common of which would be the meadow vole *(Microtus*



Map Taken From R.S. Webb & Associates	
Project #: 01-3156d Date: June 2013	
Created by: RC	
Newkirk ENVIRONMENTAL INC.	

Figure 7
Cultural Resources Map of
Cooks Mountain Mitigation Tract
Depicting Previously Recorded Cultural Resources

pennsylvanicus), short-tailed shrew *(Blarina brevicauda),* eastern woodrat *(Neotoma floridana)* and the cotton rat *(Sigmodon hispidus).* Feeding, nesting and roosting areas are abundant for wild turkey *(Meleagris gallopavo),* bobwhite quail *(Colinus virginianus)* and the mourning dove *(Zenaidura macroura).* Numerous songbirds use the forested uplands for feeding, nesting and roosting.

The managed wetlands are important feeding areas for wading birds such as the great blue heron *(Ardea herodias)* and great egret *(Casmerodius albus).* (Williams, 2004)

The previously referenced study of the Sandhills Chub by Rohde and Arndt in 1991 identified occurrence of the chub in the Wateree River Watershed. Any conservation efforts within the watershed that protect resources, including headwaters, will similarly benefit water quality and species directly tied to the resource and species using the resource.

3.4.3.6 Threat

The threat of adverse effects due to unrestricted development or timber management is low as a majority of the Cooks Mountain Site is under a conservation easement. However, this conservation easement has reservation of rights that would allow a variety of development that could reduce the value of the property for conservation.

The existing conservation easement ("existing easement") for the Cook's Mountain site is held by the Wetlands America Trust, Inc. Wetlands America Trust is an entity that holds conservation easements for Ducks Unlimited.[7] Ducks Unlimited's primary goal is to conserve, restore and manage wetlands and associated habitat for North America's waterfowl. As such, the existing easement is primarily focused on maintaining aquatic resources for the benefit of waterfowl, and allowing certain recreational activities such as hunting, and development associated with those activities. In addition, the existing easement allows for limited residential development. The most important aspect of the existing easement is that it does not cover the entire site. There is a large parcel of land

(30.75 acres) at the top of Cook's Mountain that is not included in the existing easement. This unprotected parcel is zoned RU Rural District, a classification that allows single family detached residential development.[8]

The purpose of the existing easement is to retain the property's "natural, scenic, and open condition . . . for conservation purposes and to prevent any use of the Protected Property which will impact significantly or interfere with the conservation values of the Protected Property, its wildlife habitat, natural resources or associated ecosystem." Existing easement at 4.

However, the existing easement reserves a number of rights that may either directly or indirectly impact ecological and cultural resources. Among other things, the easement reserves the right to construct five hunting cabins, two 4,000 square foot residential buildings and associated septic systems, roads, and utilities, docks, a two-acre landfill, a three-acre borrow pit, and "limited commercial or agricultural" use wells. Easement at 6-10. Under the easement, the impoundments are managed for waterfowl and the existing wetlands and water control structures can be replaced. Existing easement at 10. The easement reserves the right to conduct timber harvests and other agricultural activities including the use of chemical fertilizers. Easement at 10-11. Mineral rights are also currently reserved under the existing easement. Existing easement at 13.

Under this mitigation plan, Haile will work with SCDNR and others to improve the protections on the Cook's Mountain Site, to be highly protective of ecological and cultural resources, in particular aquatic resources, wildlife, and water quality. *See* Section 3.3, Site Protection. Whereas the current easement does not apply to a 31-acre parcel at the top of Cook's Mountain, the transfer to SCDNR of fee simple title will protect the entire site. No unprotected parcels subject to residential development and related infrastructure will remain on Cook's Mountain. This prohibition on unrestricted development and the likely secondary

7 *See Wetlands America Trust*, available at: http://www.ducks.org/philanthropy/wetlands-america-trust.
8 Richland County Code, § 26-86 RU Rural District,

effects of such development such as utility and road infrastructure, for this 31-acre parcel located at the top of the local drainage area, provides innumerable benefits for habitat, water quality, recreation, and aesthetics.

In addition, the transfer to SCDNR will provide ecological uplift by providing more stringent restrictions on activities than those allowed under the existing conservation easement that currently have the potential to negatively impact ecological and cultural resources. The extensive forested wetland systems located at the site will be protected. The same is true for the network of streams and other watercourses located on the property. Without development in the surrounding catchment, the streams will maintain or be given the opportunity to regain their natural geomorphology. In turn, sediment loads from bank erosion may be reduced providing a local and regional water quality benefit.

Economically, the highest and best use of the site, before and as a reserved right under the existing conservation easement, is for timber production and recreational purposes. Timber assessments of the site document a value in excess of $1,000,000. Improperly managed, timber operations threaten soil stability and potentially can affect water quality of the onsite and downstream aquatic resources.

3.4.3.7 Mitigation Priority Summary

Cooks Mountain – Heritage Trust Criteria				
Undisturbed Ecosystems	**Unique Landforms**	**Protected or Unique Plant or Animal Habitat**	**Outstanding Scientific, Educational, Aesthetic or Recreational Characteristics**	**Outstanding Examples of Historic or Archaeological Heritage**
Wetlands, Streams, Floodplain, and Uplands	Unique topography, river vista	Yes – Cooks Mountain	Yes – education center present	Cooks Mountain

The Cooks Mountain property is located within the 215,000 acre COWASEE Basin Focus Area. With elevations approaching 400' adjacent to the Wateree River, the Cooks Mountain Site is a unique landform to be found in the midlands of S.C. with outstanding scientific, educational, aesthetic and recreational characteristics including:

Aesthetic: Cooks Mountain rises to an elevation of 372', approximately 260' above the Wateree River and providing views over the river and river floodplain unparalleled in the midlands of S.C.

Scientific: The Cooks Mountain Site has excellent potential for research of archaeological and cultural resources. According to R.S. Webb and Associates, the site would have been suitable for pre-historic and historic human occupation and the lack of recorded resources is probably due to the lack of a comprehensive and systematic survey of the property.

The Cooks Mountain Site has excellent potential for timber management and research. The property contains an extremely diverse forest habitat, including, upland mixed pine/hardwood, upland planted pine, mesic mixed hardwood, bottomland hardwood and cypress/tupelo swamps. A current use of the property is timber management.

The diversity of habitat found on Cooks Mountain provides excellent potential for wildlife management and research. A current use of the property is wildlife management, including management for white-tailed deer, eastern wild turkey and waterfowl.

Education: The Cooks Mountain Site includes an existing environmental education center and a current use of the property is for environmental education. Other current uses include timber and wildlife management which also offers educational as well as scientific research opportunities. As previously mentioned

the Site holds the potential for archaeological and cultural resource survey and research.

Recreation: The Cooks Mountain Site holds potential for outdoor recreation activities. A current use of the property is recreational hunting. There are also nature/hiking trails and approximately 2 miles of frontage on the Wateree River.

The Cooks Mountain Site is privately owned but is currently available for sale. Fee simple acquisition of the Cooks Mountain Site is a high priority for the partners of the COWASEE Basin Focus Area, including, SCDNR, Conagree Land Trust, Ducks Unlimited, NRCS and the Richland County Conservation Commission. The perpetual preservation and management of this property under the Heritage Trust Program will not only assure the preservation of a unique landform but will also assure the appropriate long term management of aquatic resources and riparian areas, providing water quality functions and services, valuable wildlife habitat and contributing significantly to the sustainability of the Wateree River Watershed.

3.4.4 Goodwill Plantation Site

3.4.4.1 Location and Landscape Position

The Goodwill Plantation Site is 2,559 acres of relatively undisturbed and fully functional upland (1,511 acres), wetland (1,048 acres) and stream (30,706 LF streams and 29,560 LF river shoreline) ecosystems located within EPA Level III Southeastern Plains and Level IV Sandhills/Southeastern Floodplains and Low Terraces Ecoregion and the Wateree River Watershed (HUC 03050104) in Richland County (Figure 8 and 8a).

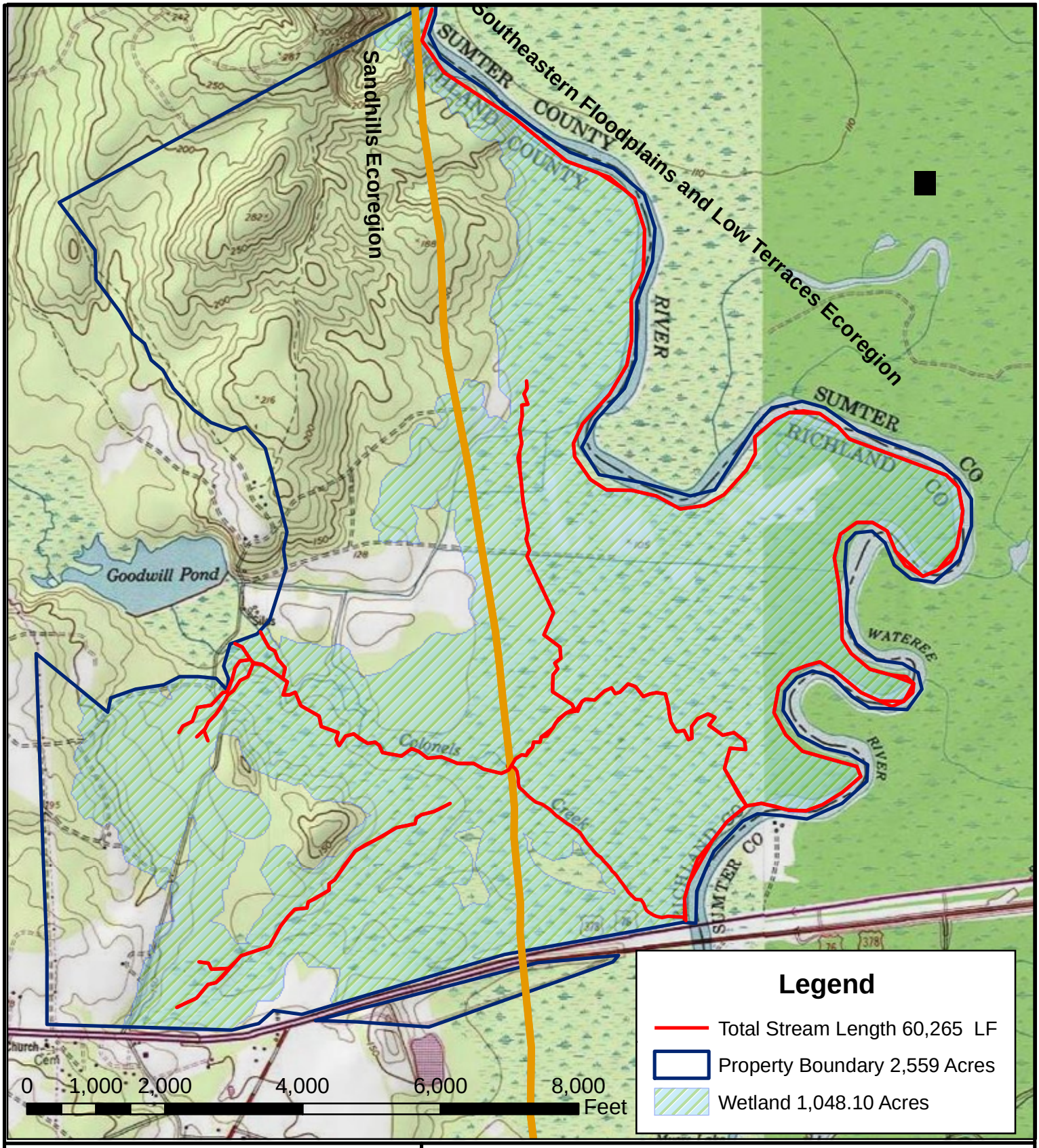
Goodwill Plantation is located immediately east of the Richland/Sumter county line formed by the Wateree River. Goodwill is approximately fifteen miles from both Columbia and Sumter. At the northern boundary of the property is Cooks Mountain, a part of this mitigation plan. The southern boundary is a four-lane highway, US-76/US-378.

While not included as an element of the Mitigation Plan, additional aquatic and wildlife benefits may accrue from the plan. The current owner of Goodwill Plantation also owns approximately 725 acres adjacent to Goodwill Plantation, which is his homestead. Haile understands that in conversations with representatives of DNR, the owner has indicated that he may place conservation easements on sensitive features that he owns, land that includes a substantial pond as well as cultural and historic buildings that date back to the early eighteen hundreds. If this occurs, it will provide additional regional benefits based on land adjacent to Goodwill Plantation.

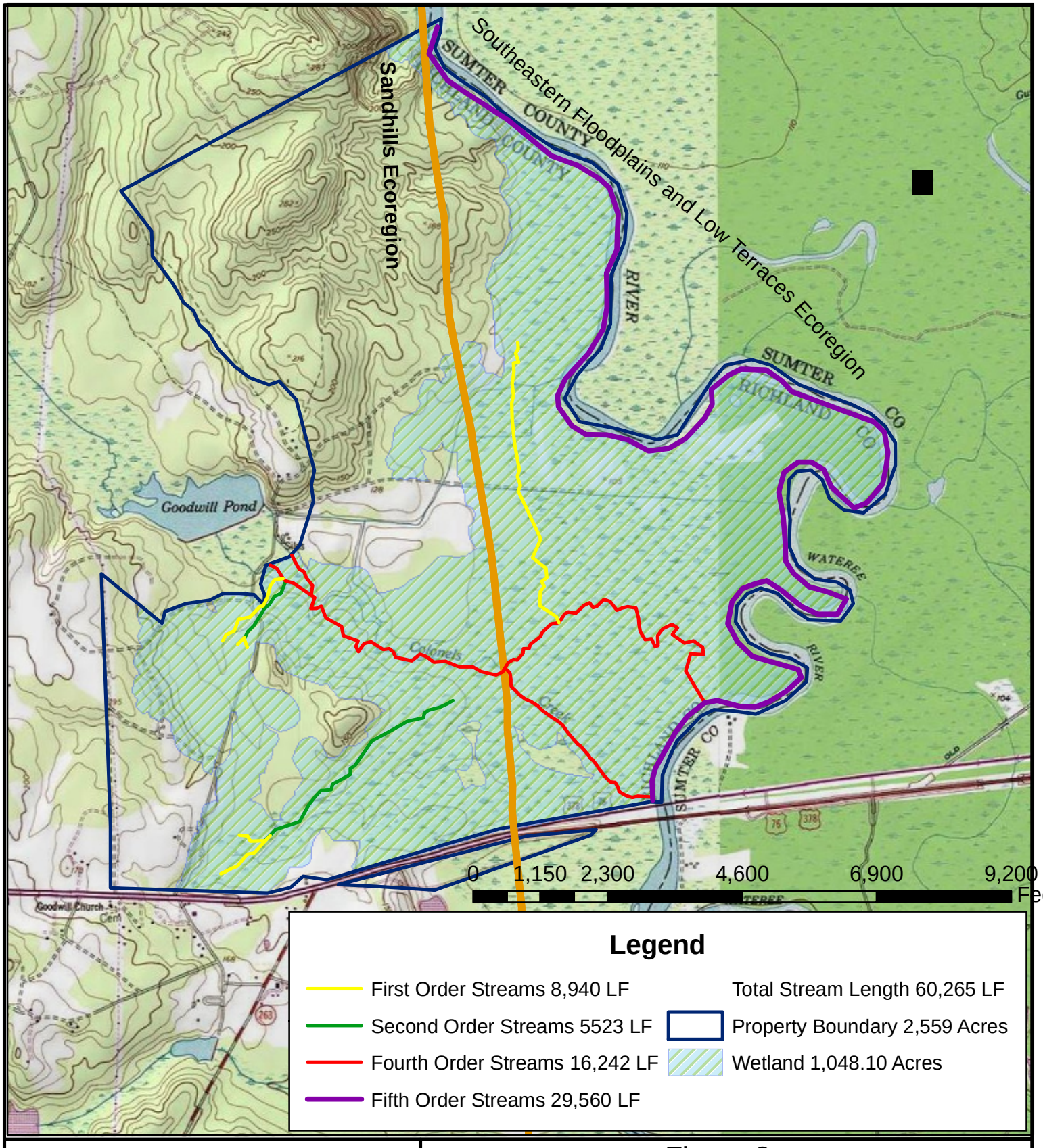
3.4.4.2 Aquatic Resources

In total, 1,048 acres of wetlands and 60,266 LF of stream and river shoreline are mapped on the site (Tidewater Environmental Services, Inc., 2013, USDA Soil Survey, and USGS) (Figure 8 and 8a). All of the aquatic resources are functional and are in an undisturbed state relative to historic and passive recreational use.

Goodwill Plantation – Aquatic Resources	
Wetlands	**Streams**
Cowardin Classification	**Order**
PFO1A	1st Order
PFO1C	2nd Order
PSS1A	4th Order
PFO4B	5th Order
PFO1B	
PFO1Fh	
PUBH	
PSS1C	
PFO1A	



Wetland Field Exhibit	Figure 8 Goodwill Plantation HUC 03050104 EPA Level IV Sandhills and Southeastern Floodplains and Low Terraces Ecoregions Richland County, SC
Project #: 3156 Date: June 2013	
Created by: WW	
Newkirk ENVIRONMENTAL INC.	



Wetland Field Exhibit

Project #: 3156 Date: June 2013

Created by: WW

Newkirk ENVIRONMENTAL INC.

Figure 8a
Goodwill Plantation
HUC 03050104
EPA Level IV Sandhills and Southeastern Floodplains and Low Terraces Ecoregions
Richland County, SC

An unnamed tributary, flowing southeast for approximately 0.25, miles drains a small portion of the northeastern section of the Site into the Wateree River, which creates the entire eastern property boundary. Two unnamed tributaries flowing NNE for approximately 0.31 miles join Colonels Creek near its intersection with the property boundary. Colonels Creek continues to flow southeast toward the Wateree River for approximately 1.02 miles until branching. The, approximately 1.23 mile, upper branch of Colonels Creek is joined by an unnamed tributary flowing south for approximately 1.02 miles; creating the central eastern drainage for the Site. Another unnamed tributary beginning in the southwest corner of the Site travels northeast for approximately 1.21 miles converging with the lower branch of Colonels Creek, draining another approximately 0.68 miles into the Wateree River.

As the two properties abut, the characterization of wetlands and streams within Goodwill Plantation is similar and in some places common to Cooks Mountain. Descriptions of typical aquatic habitats are found in 3.4.3.2.

Hydrology of the floodplain area is derived from a combination of continuous

hydrologic inputs from the streams and ground water seepage flowing from the adjacent upland slopes and occasional flood events.

3.4.4.3 Upland Resources and Vegetation

Like the aquatic habitats, many of the same upland habitats within Goodwill Plantation area shared with Cooks Mountain. While not attaining the same final elevation as Cooks Mountain, the steep, north-facing bluffs down to the Wateree River support a mature and remarkably diverse assemblage of conifer and hardwood species of trees for the Midlands region of the state.

Previous studies (Appendix G) of Goodwill have served to document habitats and the importance of this site.

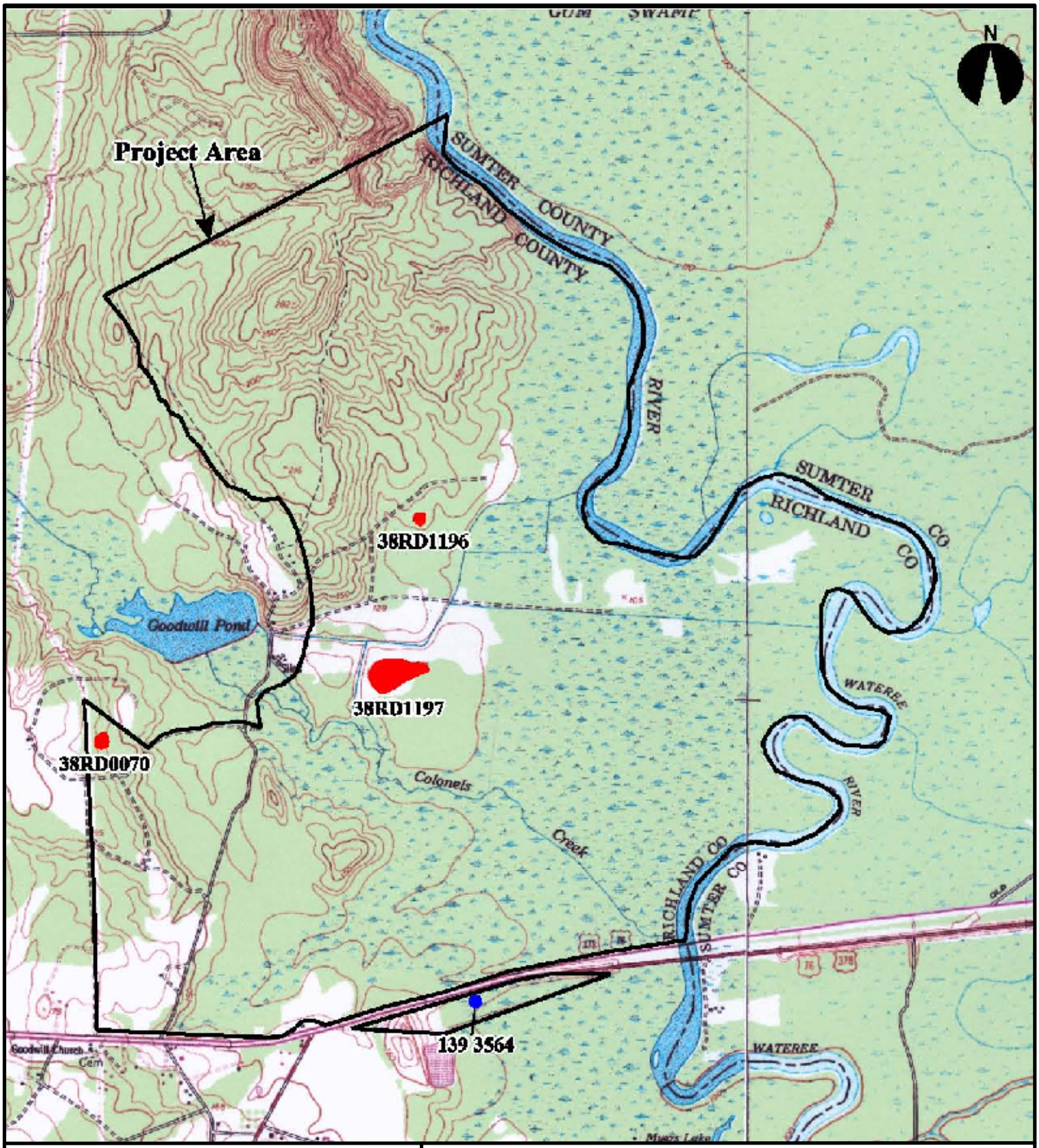
> *Goodwill Plantation at 3,285 acres in size represents a unique opportunity for S.C. Heritage to protect a large tract of the sandhill type of the longleaf pine ecosystem. Existing Heritage Preserves in this region are relatively small (less than 1000 acres) and hemmed in by development. An exception is the Aiken County Gopher Tortoise Heritage Preserve; yet this site differs from Goodwill in several important respects:*
>
> *As defined by the Nature Conservancy's plant community classification system, the longleaf community at the Aiken County site is the G3-ranked "Longleaf Pine / Turkey Oak - Bluejack Oak / Southern Dwarf Huckleberry / Carolina Wineglass Woodland", while at Goodwill the predominant longleaf community is the 02-ranked "Longleaf Pine Turkey Oak - Bluejack Oak / Southern Dwarf Huckleberry / Little Bluestein South Carolina Woodland", In other words Goodwill's non-wineglass variant—a South Carolina endemic—is, from a regional perspective, rare and in jeopardy. Sites such as Goodwill, with extensive acreage in a diversity of age classes of longleaf, are rare in South Carolina. Moreover, the rocky and hilly edaphic/topographic conditions are unusual in longleaf forests.* (SCDNR -Judge, 2001)

3.4.4.4 Cultural Resources

Goodwill Plantation is well known for its highly significant historic and cultural values. In 1985, the University Of South Carolina Department Of History conducted a study of the Goodwill Plantation site and identified and recorded eight (8) archaeological sites, three (3) landscape features and seven (7) structures (Figure 9). Goodwill Plantation was listed on the NRHP in 1986 for its significance to the history of South Carolina. In addition to the plantation, the property includes the location of a historic ferry crossing on the Wateree River and is the location of significant inland rice cultivation. Additional information is provided in Section 3.8 and Appendix F & G.

3.4.4.5 Wildlife Resources

At more than 2500 acres, Goodwill Plantation and the diverse habitats within the property serve to host significant wildlife populations. Many of the same species are found on Goodwill Plantation as in Cooks Mountain, with greater carrying capacity due to the size. Together, Goodwill and Cooks Mountain will create a significant resource of preserved habitats.



Map Taken From R.S. Webb & Associates	
Project #: 01-3156d Date: June 2013	
Created by: RC	
Newkirk ENVIRONMENTAL INC.	Figure 9 Cultural Resources Map of Goodwill Plantation Mitigation Tract Depicting Previously Recorded Cultural Resources

One species-element, *Macbridea caroliniana*, a globally rare flowering plant (GRANK: 02G3) has been observed, in a small but apparently reproductive population within Goodwill Plantation. *M, carolinina* --with the fanciful common name of the Carolina egg-in- a-nest mint is endemic to South Carolina and Georgia, where it thrives in areas with permanent groundwater seepage associated with hardwood swamp systems. Several large colonies of this stoloniferous, showy plant have been documented along the -South Fork of the Edisto River, the Savannah River Site, and the Congaree National Monument, the latter site being the largest known site protecting the species in perpetuity. Goodwill Plantation would be the first attempt to include this species in the Heritage Trust system of preserves. This species is currently under review for listing under the U.S. Endangered Species Act upon completion of a range-wide status survey and evaluation by U.S. Fish and Wildlife Service.

Evidence of an extensive nesting site of colonial water birds and use of the site by waterfowl has also been noted (Judge, 2001).

South Carolina is part of the Atlantic Flyway and provides important winter habitat for waterfowl that are produced in the prairies, Great Lakes and eastern Canada. South Carolina's coastal and interior wetlands provide important habitat for significant numbers of mallards, green-winged teal, ring-necked ducks, northern pintails and wood ducks. Goodwill (and Cooks Mountain) is included in the COWASSE Basin Focus Area which is a priority waterfowl restoration area where many partners are implementing research and management to improve waterfowl habitat and populations. Staff from the S.C. Dept. of Natural Resources and the U.S. Fish and Wildlife Service band mallards as part of a waterfowl monitoring project, including past banding within Goodwill.

Semi-permanently flooded freshwater reserves offer an alternative to moist-soil management in freshwater wetlands. These wetlands provide year-round habitat for breeding wood ducks. wading birds, and wetland songbirds. Flooded reserves also provide foraging habitat for ospreys, bald eagles, river otters, and alligators. Populations of warm

water fishes and amphibians (e.g., bullfrogs) may also increase providing recreational opportunities.

Like Cooks Mountain, the previously referenced study of the Sandhills Chubb by Rohde and Arndt in 1991, identified previously unknown occurrence of the chub in the Wateree River Watershed. Any conservation efforts within the watershed that protect resources, including headwaters, will similarly benefit water quality and species directly tied to the resource.

3.4.4.6 Threat

The threat of adverse effects to the Site due to land development activities is high as the property is located approximately 15 miles east of the City of Columbia, adjacent to the Wateree River and with approximately 1500 developable upland acres. The property has good access with frontage on US Highway 76/378, a four lane highway, and is currently zoned RU in Richland County which provides for agriculture uses and low density residential development.

3.4.4.7 Mitigation Priority Summary

Goodwill Plantation – Heritage Trust Criteria				
Undisturbed Ecosystems	**Unique Landforms**	**Protected or Unique Plant or Animal Habitat**	**Outstanding Scientific, Educational, Aesthetic or Recreational Characteristics**	**Outstanding Examples of Historic or Archaeological Heritage**
Wetlands, Streams, Floodplain, and Uplands	River bluffs and 51/2 miles of river shoreline	*Macbridea caroliniana*	Cultural resources and waterfowl management	Yes

The Site is located within the 215,000 acre COWASEE Basin Focus Area. The Goodwill Plantation Site contains outstanding examples of historic and archaeological resources and opportunities for scientific research, education and recreation as well as a diverse ecology,

including, an unusual sand hill type long leaf pine ecosystem and a reproductive population of *Macbridea Caroliniana*, aka: Carolina egg-in-nest-mint. Acquisition of the Goodwill Plantation Site is considered a linchpin property and a high priority for the partners of the COWASEE Basin Focus Area. The Goodwill Plantation Site is privately owned but is currently available for sale. The perpetual preservation and management of this property under the Heritage Trust Program will insure the preservation and appropriate management of important and significant historic and cultural resources and significant upland and aquatic resources and riparian areas, providing water quality functions and services and contributing to the sustainability of the Wateree River Watershed.

3.4.5 Baseline Summary

	Heritage Trust – Threshold Criteria				
	Undisturbed Ecosystems	**Unique Landforms**	**Protected or Unique Plant or Animal Habitat**	**Outstanding Scientific, Educational, Aesthetic or Recreational Characteristics**	**Outstanding Examples of Historic or Archaeological Heritage**
Rainbow Ranch	Yes	Yes	Yes	Yes	Potential
Cooks Mountain	Yes	Yes	Yes	Yes	Yes
Goodwill Plantation	Yes	Yes	Yes	Yes	Yes

3.5 Mitigation Work Plan

Upon issuance of all necessary state and federal permits and authorizations (and absent an appeal of these authorizations) to mine at the Haile Gold Mine project and prior to commencement of any work under the 404 permit, Haile will dedicate the mitigation sites for the purpose of establishing them as "Heritage Preserves" by entering into a "Dedication Agreement" and transferring fee simple title of the sites to the SCDNR for such purpose, along with agreed upon endowments and other monetary payments due at that time. Additional payments will be submitted to SCDNR in accordance with a schedule agreed upon by Haile, SCDNR and the USACE. The preservation goal of the Plan will be met

upon execution of the "Dedication Agreement" and transfer of fee simple title.

3.6 Maintenance and Long Term Management

Long term maintenance and management of the mitigation Sites will be conducted as determined necessary and appropriate by SCDNR under the Heritage Trust Program.

3.7 Financial Commitments.

The mitigation plan provides significant financial commitments for the benefit of the mitigation sites and regional aquatic needs. Haile will provide an endowment to SCDNR totaling $4.5 million. $1 million will be transferred in an initial payment, and Haile will pay $300,000 per year for 15 years ($3.5 million paid over time). These funds are provided for maintenance and management of the sites. Based on discussions with SCDNR, these funds can be used for a variety of projects, such as wildlife enhancement or other resource enhancements consistent with the Heritage Trust Program.

In addition, Haile will provide a $4.9 million endowment to SCDNR for the benefit of projects to benefit the endangered heelsplitter mussel. Haile understands that SCDNR intends to work cooperatively with the U.S. Fish and Wildlife Service in applying this special endowment.

3.8 Historic and Cultural Resources

The sites selected for the Mitigation Plan offer significant opportunity for preservation and protection of historic and cultural resources. The value of the historic and cultural resources in this mitigation plan has been discussed with and viewed favorably by NGOs and state agencies. In addition, the historic and cultural values, set in the same sites as the outstanding aquatic resources, enhance the value of those resources for wetland and stream mitigation. The Mitigation Rule allows consideration of the "public interest" factors in review and approval of mitigation plans. 33 C.F.R. §332.1(d). In addition, relying upon the Mitigation Rule's admonition to consider regional priorities for preservation and protection, these Sites with extraordinary historic and cultural value are a high priority for regional protection. This Section 3.8 summarizes the historic and culture resources at the three Sites selected for the Mitigation Plan.

3.8.1 Goodwill Plantation Site

National Register of Historic Places: One NRHP-listed property, Goodwill Plantation, covers the entire Site area and a portion of the property extends west beyond the study site (See Figures in Appendix F). Goodwill Plantation was listed on the NRHP in 1986 and is considered significant at the state level under the area of social history. By 1799, Goodwill Plantation was established as a working plantation by Daniel Huger, II, who used it to supply his lowcountry rice plantations. Goodwill Plantation thrived until the Civil War, which by that time was owned by Edward Heyward, a lowcountry planter. During the war, Heyward evacuated his lowcountry slaves to Goodwill. After emancipation, tenant farming drove the economy. The plantation was sold to George Wickes in 1869, who constructed and ran a mill from the property. Between 1874 and 1910, ownership changed numerous times.

Resources Recorded During the 1985 University of South Carolina Department of History Study:
In 1985, eight archeological sites, three landscape features, and seven structures were recorded on Goodwill Plantation by the University Of South Carolina Department Of History (Applied History Program, Department of History, University of South Carolina 1985). The archeological sites are described as follows:

1) a Woodland period lithic and ceramic scatter
2) the site of the “Old mill” circa 1750-1827
3) the “Old Settlement” circa 1750-1820's
4) a “Cellar” circa 1750-1857
5) a chimney with ceramics and glass circa 1750-1857
6) a “Structure Site” with “Fields” and a “Possible Grave Site” circa 1756-1857
7) a “Probable Mill Site” pre-1857
8) a “Well Site, Probably Location of Stockade Site” circa 1893

The recorded landscape features are comprised of:

1) a post-1750 “Ford” or “Ferry Location”
2) “Embanked, Irrigated Alluvial Fields” circa 1779-1820
3) a “Portion of Old Statesburg Road” circa 1827-1857

The Statesburg Road section features an elevated approach to a crossing over a diversion canal and the remains of a wooden bridge. The structures consist of:

1) a pre-1857 "Overseer's House"
2) two "Slave Cabins" circa 1858-1864
3) the two-and-a-half story "Mill" with intact machinery circa 1858-1870
4) a "Blacksmith's Shop" circa 1865-1910
5) the "House Above Millpond" circa 1888-1894
6) a post-1900 "Tenant House"
7) a post-1900 "Lodge"

NRHP Web Site Goodwill Plantation Listing: Currently, the NRHP web site for listed properties in South Carolina identifies nine extant historic structures and two specific landscape features. Structures include:

1) the "Main House"
2) the "Overseer's House"
3) the "Mill Building"
4) "Slave Cabins"
5) the "Tenant House"
6) the "Lodge"
7) a "Carriage House"
8) a "Barn"
9) a "Corn Crib"

Landscape features are comprised of:

1) the "Mill Pond"
2) a "portion of the canal irrigation system"

2013 South Carolina Archeological Site Files Review (SCIAA): Three archeological sites are recorded within the Goodwill Plantation Site. Two of these are known by site form only. They are:

1) 38RD1196, an 18th century chimney pile/artifact scatter

2) 38RD1197, a Middle/Late Archaic lithic scatter and an Early Woodland lithic/ceramic scatter
3) The third archeological site was recorded within the Goodwill Plantation Site in 1973 during the survey of the Wateree-Pineland 230 KV power transmission line corridor (Miller 1973). Site 38RD0070 was identified as an 18th century ceramic/glass scatter.

2013 ArchSite Database Search: In addition to the archeological sites discussed above, a search of the ArchSite database revealed that two historic resources are present within the Site. One is the NRHP-listed Goodwill Plantation, which is discussed above. The other historic resource, Resource No. 139-3564, is an interpretive marker entitled, "Wateree River Ferries" which is presumed to be near the location of the historic ferry crossing on the nearby Wateree River (The Jaeger Company 1993).

3.8.2 Cooks Mountain Site

National Register of Historic Places: No properties eligible for, or listed on, the NRHP have been recorded within Cooks Mountain. The NRHP-listed Goodwill Plantation abuts the southern boundary.

2013 South Carolina Archeological Site Files Review (SCIAA): The 1973 archeological survey of the Wateree-Pineland 230 KV power transmission line corridor (Miller 1973) noted above may have passed through the southwestern corner of the site. No archeological Sites were found in this area during this study and no recorded archeological sites are present elsewhere within the Cooks Mountain study site. More than half of the Cooks Mountain Site is composed of Wateree River swamp, which could explain why no cultural resources have been recorded in the northern two-thirds of the Site. A review of the topography in the southern third of the site indicates that there are a number of locations that would have been suitable for prehistoric and historic human occupation. The lack of recorded resources in this area is probably due to the lack of a systematic survey for such resources.

2013 ArchSite Database Search: A search of the ArchSite database identified one resource within the Site, Cooks Mountain (Resource No. 139-3573) (The Jaeger Company 1993). Cooks Mountain is primarily a remarkable and prominent natural feature; however, the mountain was well known to early historic travelers/explorers and became an important landmark. During his travels through the area in 1700, John Lawson commented on this feature. In 1770, surveyor James Cook bought, named, and lived

on Cooks Mountain while commissioned to survey/map South Carolina. His detailed map was published in 1773 and shows "Cooks" as a place name on the west side of Wateree River in the vicinity of the current site (Cumming 1974). This suggests that Cook's residence probably was located on or near Cooks Mountain.

3.8.3 Rainbow Ranch Site

No properties eligible for, or listed on, the NRHP have been recorded within the Rainbow Ranch Site. No previously recorded cultural resources are located within or immediately adjacent to this Site. The Rainbow Ranch Site covers 700 acres and a review of the topography in this area indicates that there are numerous locations that would have been suitable for prehistoric and historic human occupation. The absence of recorded cultural resources within the site is probably due to the lack of a systematic survey for such resources.

4.0 SUMMARY AND CONCLUSION

The Haile Gold Mine Mitigation Plan represents a unique opportunity to accomplish landscape scale conservation of outstanding resources, consistent with ongoing regional conservation efforts and goals in accordance with the 2008 Mitigation Rule.

The Mitigation Plan has identified three Sites which are high priorities for acquisition and preservation within their respective watersheds, including the Rainbow Ranch Site (Lynches River Watershed), Cooks Mountain Site and Goodwill Plantation (Wateree River Watershed). These Sites contain outstanding natural and cultural resources including:

- Relatively undisturbed ecosystems with protected or rare plants and/or animals,
- Unique landforms,
- Outstanding examples of cultural heritage and,
- Important scientific, educational, aesthetic or recreational characteristics.

The Mitigation Plan will provide permanent protection to 4,388.80 acres within the Lynches and

Wateree River Watersheds and Piedmont and Southeastern Plains Ecoregions including 1561.31 acres of wetlands 118,561 linear feet of steams or river frontage and 2827.49 acres of adjacent uplands and riparian areas by fee simple transfer to SCDNR Heritage Trust Program. The long term preservation and management of these Sites and their outstanding aquatic and riparian resources under the Heritage Trust Program will contribute significantly to the sustainability of these watersheds, providing important physical, chemical and biological functions and fully mitigating for lost aquatic resource functions and services as a result of the construction and operation of the Haile Gold Mine.

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APPENDIX A

COWASSEE Basin Conservation Plan

COWASEE Basin Conservation Plan

Introduction and Description

The Wateree River and Congaree River valleys and adjoining bluffs and high hills all merge in the heart of South Carolina to form the Santee River and headwaters of Lake Marion. These three Palmetto State river valleys comprise the ecologically important COWASEE Basin, a significant corridor of rural, undeveloped green space southeast of Columbia and southwest of Sumter. COWASEE is short for the Congaree-Wateree-Upper Santee River system an area covering over 215,000 acres in the midlands of South Carolina including portions of Richland, Sumter, Clarendon, Calhoun and Lexington counties. This area, containing some of the most significant natural, historical and cultural resources in South Carolina contributes to the quality of life of central South Carolina through abundant natural, cultural and scenic resources, diverse landscapes and public recreational opportunities. Recognizing its importance, conservationists, led by private landowners, non-governmental organizations, the U.S. Department of Agriculture and the South Carolina Department of Natural Resources defined the COWASEE Basin Focus Area in 2005, naming it as one of the state's premiere landscape ecosystems and an area worthy and in need of conservation.

The COWASEE Basin Focus Area is defined to include its Congaree River Basin component bounded by I-77 between I-26 and S-40-48 (Bluff Road), thence southeast to U.S. Highway 601, thence north to form the Wateree Basin component to I-20, thence to U.S. Highway 521, thence south following to S.C. Highway 261, thence south on S-43-51 becoming S-14-76 in Clarendon County to Jacks Creek, thence west along the south side of Jacks Creek and southwest across Lake Marion to the south side of Halfway Swamp Creek in Calhoun County, thence northwest along S-9-267 merging into S-9-80, S-9-419 and S-9-25 to U.S. Highway 176, thence northwest to I-26 and thence to I-77 to complete the boundary.

Included in the COWASEE Basin is the federally titled 26,546-acre Congaree National Park (U.S. Park Service) and state properties to include Wateree River Correctional Institute (S.C. Department of Corrections), Manchester State Forest (S.C. Forestry Commission), Poinsett State Park (S.C. Department of Parks, Recreation and Tourism), Congaree Bluffs Heritage Preserve (S.C. Department of Natural Resources) and Upper Lake Marion also known as the Santee Swamp (S.C. Public Service Authority) as well as properties protected under private land conservation easements.

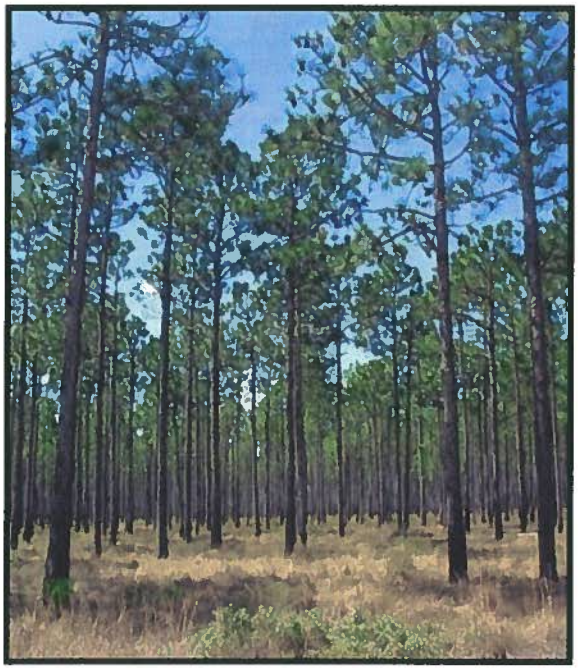
Recognized Conservation Plans

The COWASEE Basin is home to important migrating, wintering and breeding waterfowl habitat, shore and wading bird habitat, as well as habitat critical to neotropical migrant songbirds and a diverse group of native grassland bird species. Because of its importance to a broad group of bird species, the COWASEE Basin Conservation Project is conducted under the umbrella of a number of national and regional conservation initiatives to include the North American Waterfowl Management Plan (NAWMP) and its Atlantic Coast Joint Venture, the North American Bird Conservation Initiative, Partners in Flight, the United States Shorebird Conservation Plan (USSCP) and the National Bobwhite Conservation Initiative (NBCI). The North American Waterfowl Management Plan was initiated in 1985 in response to plummeting numbers of migratory waterfowl across the continent. The central premise of the North American Waterfowl Management Plan is protection and enhancement of existing nesting, migrating and wintering waterfowl habitat. The Atlantic Coast Joint Venture is the implementation program of NAWMP in the Atlantic states. Partners in Flight was launched in 1990 in response to growing concerns about declines in the populations of many land bird species that were not covered under other conservation initiatives, particularly neotropical migrant species. The focus of Partners in Flight is to combine, coordinate and increase resources in order to achieve the highest order of success in bird and habitat conservation in the Northern Hemisphere. The USSCP was originated in the mid-1990s and its goals were formalized in 2000 in order to provide a scientific framework to determine species, sites and habitats that most urgently need conservation action. The NBCI is the unified strategic effort of 25 state fish and wildlife agencies and various conservation organizations to restore wild populations of bobwhite quail in this country to

levels comparable to 1980 through restoration and maintenance of native grassland habitats to the benefit of a diverse assemblage of grassland dependent species.

Threats

The abundant, unique and diverse resources of the COWASEE Basin are under threat from a variety of contemporary land use practices and changes including encroaching development and urbanization, habitat loss and degradation, conversion of land to non-traditional uses and poor land use practices. Continued development and sprawl along the U. S. 378 corridor between Columbia and Sumter typifies the types of land use changes that threaten fish and wildlife populations and water quality within the Basin. These land use changes and practices foster an even greater threat to the COWASEE Basin through fragmentation of habitats. Habitat fragmentation negatively impacts wildlife population viability by reducing the amount or quality of available habitat, removing native vegetation and increasing opportunities for invasive species to become established. Fragmented habitats may not be large enough nor adequately connected to support species that need more territory in which to reproduce, rear young, forage for food resources and store healthy body reserves. The loss and fragmentation of habitat make it difficult for migratory species to find places to rest and feed along their migration routes. Smaller and disjoint patches of habitat support more tenuous populations of wildlife increasing their vulnerabilities to disease and predation. Habitat fragmentation along with urbanization also renders it difficult to continue traditional habitat management efforts such maintenance of fire-based ecosystems due to concerns over smoke management. Efforts clearly are needed in the



COWASEE Basin to support and maintain large, well-connected corridors of specialized habitats needed for rare, endangered or species of conservation concern.

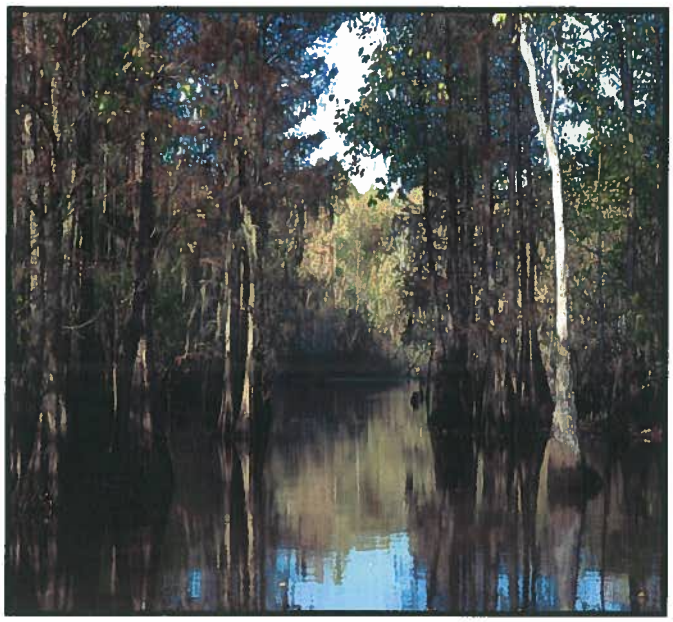
The preservation of whole ecosystems represents an ideal in conservation that is often impractical or difficult to achieve. However, the COWASEE Basin Focus Area presents a unique opportunity to enhance landscape-scale conservation. The Basin houses the nation's largest remaining stand of old-growth bottomland hardwood forest in the southeast, in addition to other publicly owned resources such as Congaree Bluffs Heritage Preserve and the Manchester State Forest. Roughly 68% of the land within the Basin is privately owned. The Focus Area concept encourages conservation of private land through voluntary conservation easements. The addition of privately owned conservation areas, particularly those adjacent to or in close proximity to larger or ecologically sensitive areas, acts to protect and enhance the existing outstanding natural, cultural and recreational resources of the COWASEE Basin.

Objective

In 2005 a partnership of private landowners, conservation organizations, land trusts and government agencies came together to partner on the COWASEE Basin Focus Area, an initiative to maintain and enhance conservation and natural resources of the area. Since large public ownership within the COWASEE Basin is achievable typically only through scarce agency funding and governmental appropriations, the partnership primarily works with willing private landowners to promote stewardship using a variety of tools ranging from technical and financial assistance to conservation easements. The key for this initiative is to encourage the continuation of private ownership while ensuring long-term protection and enhancement of resource stewardship. Currently there are more than 110,000 acres of protected property in the COWASEE Basin to include more than 38,000 acres of private land conservation. The overarching objectives of the COWASEE Basin Conservation Project are to protect and enhance important lands, waters, rare and sensitive habitats, cultural sites and diverse natural resources of the midlands while maintaining in perpetuity, for the benefit of Palmetto State citizens, the long-honored traditional uses

of hunting, fishing, forest management and agriculture.

Natural Resources



The heart of the COWASEE Basin consists of the life-giving waters of the Congaree, Wateree and Upper Santee rivers which nourish their fertile floodplains. These great rivers drain an immense watershed of 13,000-square miles that stretches far into western North Carolina. About 32% of the COWASEE Basin consists of state and federal lands including South Carolina's only national park, the Congaree National Park, as well as such significant state lands as Sparkleberry Swamp, Congaree Bluffs Heritage Preserve, Poinsett State Park and Manchester State Forest.

Most of the COWASEE Basin Focus Area consists of the bottomland hardwood forests of the Congaree, Wateree and Upper Santee rivers, but it also includes bordering river bluffs, high hills and uplands. The floodplain forests of the COWASEE Basin are some of the most extensive and biologically diverse in the Southeast. They support nearly a hundred species of woody shrubs and trees, and are some of the most productive wildlife habitats in North America. The high hills and bluffs, some of which exceed 350 feet above sea level, support vegetation more typical of the Upper Piedmont and Mountains such as sourwood, mountain laurel, white ash, beech, white oak and short-leaf pine. Hillside seeps draining water through high hills and river bluffs support indigenous and unique floristic communities.

Some of the most dense wintering songbird populations in the eastern United States have been recorded in these bottomland forests. Two areas within the Basin, the Congaree National Park and the Upper Santee Swamp, have been recognized as "Globally Important Bird Areas" by the National Audubon Society because of their outstanding bird values. Some of the highest winter songbird densities ever recorded in the United States have been observed in this basin, having more than 5,100 birds

per square mile. Water birds find refuge in the wetlands of the COWASEE Basin including yellow-crowned night heron, great egret, great blue heron, little blue heron, cattle egret, white ibis, anhinga and double-crested cormorant. During its post-breeding dispersal from coastal rookeries, the endangered wood stork forages in the numerous shallow pools and wetlands of the Basin.

Cultural Resources

Currently the COWASEE Basin has 28 sites on the National Register of Historic Places including four National Historic Landmarks and one National Historic District at Stateburg, the geographic center of the state and once planned to be the site of the state capitol. The COWASEE Basin is the site of the first exploration of interior North America with the arrival of the Spanish explorer Hernando de Soto in 1540 on his search for the Indian town of Cofitachequi. The English explorer, John Lawson, traveled through the high hills of the Santee and described a "...alp with a top like a Sugar-loaf..." which may have been the first written description of Cooks Mountain. The COWASEE Basin was the scene of much action during the Revolutionary War, and the peace and prosperity following the war led to the establishment of large planter estates founded on rice and cotton production, such as Kensington, Millford, Mulberry and Goodwill plantations. Basin Landing on the Wateree at Goodwill Plantation was the hub of midlands agricultural commerce shipping products to Charleston for lucrative European export. Cultural and historic resources of the COWASEE Basin are exemplary, worthy of protection and additional documentation.

Recreation

The wetlands and waterways of the COWASEE Basin long have been known to sportsmen as providing unparalleled hunting, fishing and boating opportunities, but naturalists, birders, photographers, hikers and canoeists also have discovered the many scenic

attributes of rivers, marshes and swamps of the COWASEE Basin.

The COWASEE Basin has a strong and enduring hunting and fishing culture. The extensive bottomland forests are a significant wood duck production and wintering ground, and the Focus Area is now a priority waterfowl restoration area where many partners are implementing research and management to improve waterfowl habitat and populations.

Abundant waters and wetlands provide for some of the finest freshwater fishing in the state. The rich waters of the COWASEE are an outstanding fishery resource for catfish, sunfish, large-mouth bass, striped bass, shad, herring and others. In addition, the endangered short-nosed sturgeon also utilizes the Upper Santee, Congaree and lower Wateree rivers.

COWASEE Basin Focus Area Partners

NRCS Natural Resources Conservation Service

Ducks Unlimited
Conservation Today, Wetlands for Tomorrow

Friends of Congaree Swamp

South Carolina Department of Natural Resources
DNR

Richland County Conservation Commission
2020 Hampton Street • Room 3063A
PO Box 192 • Columbia, SC 29202
803-576-2084

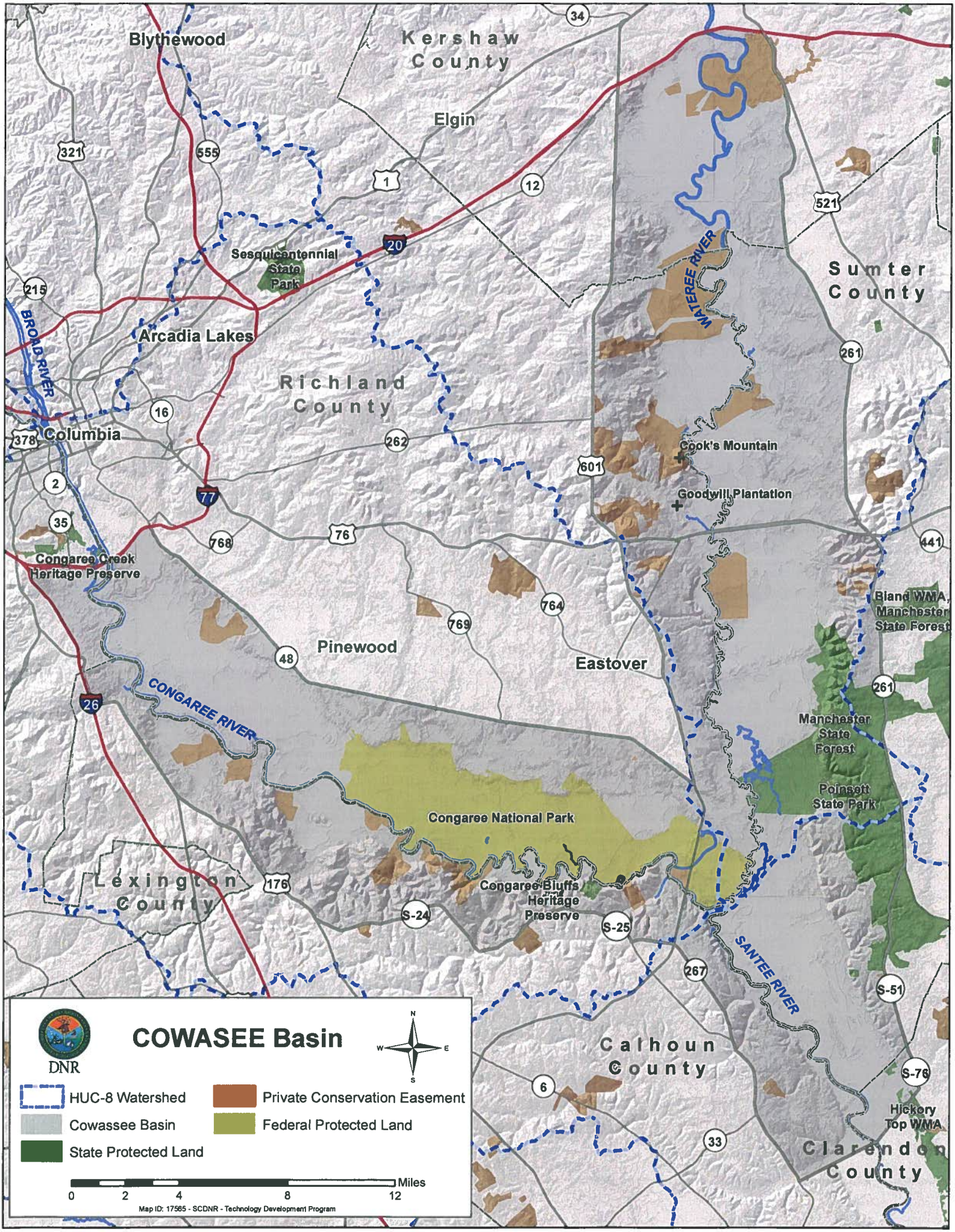
Sumter County
Soil & Water Conservation District

Congaree Land Trust

COWASEE Basin Protected Lands[1]

Protected Tract	Acres	Easement Holder
Congaree National Park	26,546	United States Park Service
Congaree Bluffs Heritage Preserve (State)	201	S. C. Department of Natural Resources
Manchester State Forest	21,500	S. C. Forestry Commission
Poinsett State Park	1,000	S. C. Department of Parks, Recreation and Tourism
Santee Swamp	16,000	S. C. Public Service Authority
Wateree Correctional Institute	7,000	S. C. Department of Corrections
Anderson	140	Congaree Land Trust
Beech Creek Timber	2,192	Natural Resources Conservation Service
Brady Tracts	926	Congaree Land Trust
Buckeye Farms	1,000	Congaree Land Trust
Carpenter (Buyck's Bluff)	700	Ducks Unlimited
Cleveland Swamp	1,500	Natural Resources Conservation Service
Coggins	90	Congaree Land Trust / *MAJIC
Congaree Carton Tract	4,912	Congaree Land Trust
Congaree Land Trust	55	Congaree Land Trust
Congaree Landing (Phillips)	263	Congaree Land Trust
Cooks Mountain	1,095	Ducks Unlimited
Devil's Orchard	468	Natural Resources Conservation Service
English Swamp	1,400	Natural Resources Conservation Service
FB SC Tracts	4,301	Congaree Land Trust
High Creek	1,670	Congaree Land Trust
Joe Woodard	34	Natural Resources Conservation Service
Johnson	20	Natural Resources Conservation Service
Ken Simmons (Birchwood Farms)	405	Congaree Land Trust
Langs Neck	334	Natural Resources Conservation Service
Mill Creek	950	Ducks Unlimited
Mine Hill Community Combined	416	Congaree Land Trust / MAJIC
Mulberry Plantation	2,915	Ducks Unlimited
Muller Lake	2,874	Ducks Unlimited
Murray Tract	392	The Conservation Fund
Murray Tracts	1,407	Congaree Land Trust
Pace	363	Congaree Land Trust
Peterkin	328	Congaree Land Trust
Plunkett Hill	594	Congaree Land Trust / MAJIC
River Tracts	688	Natural Resources Conservation Service
Rivercreek	331	Natural Resources Conservation Service
Savage Tract (Beidler)	1,904	Congaree Land Trust / MAJIC
Saylor Lake	395	Congaree Land Trust
Street Enterprises	1,084	Natural Resources Conservation Service
Sumter Wateree Club	3,749	Congaree Land Trust
Tobin	329	Natural Resources Conservation Service
Watkins	331	Congaree Land Trust
Total Protected Lands	**110,256**	*Midlands Area Joint Installation Consortium

[1] Updated June 2013


Blythewood
Kershaw County
Elgin
Sesquicentennial State Park
Arcadia Lakes
Richland County
Columbia
Sumter County
WATEREE RIVER
BROAD RIVER
Cook's Mountain
Goodwill Plantation
Congaree Creek Heritage Preserve
Pinewood
Eastover
CONGAREE RIVER
Bland WMA, Manchester State Forest
Manchester State Forest
Poinsett State Park
Congaree National Park
Congaree Bluffs Heritage Preserve
Lexington County
SANTEE RIVER
Calhoun County
Hickory Top WMA
Clarendon County
COWASEE Basin
DNR
HUC-8 Watershed
Cowassee Basin
State Protected Land
Private Conservation Easement
Federal Protected Land
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APPENDIX B

Technical and Scientific Considerations For Upland and Riparian Buffers

Technical and Scientific Considerations for Upland and Riparian Buffer Strips in the Section 404 Permit Process

PURPOSE: Effective natural resource management within watersheds often requires the establishment, protection, and management of vegetated buffer strips to provide for physical (e.g., protection of water quality) and ecological (e.g., plant and animal habitat) functions. Since passage and subsequent amendments to the Clean Water Act (CWA), the U. S. Army Corps of Engineers (Corps) has had legal authority during Section 404 permit decisions to require vegetated buffer strips as part of the mitigation for filling wetlands.[1] Among the goals of the CWA are restoration and maintenance of the chemical, physical, and biological integrity of the Nation's waters, and attainment of "water quality which provides for the protection and propagation of fish, shellfish, and wildlife" (33 U.S.C. 1251(a)(2)). Vegetated buffer strips, such as forested riparian areas, may be well-suited for this purpose, and "are a critical element of the overall aquatic ecosystem in virtually all watersheds" (Federal Reg. 67(10), p. 2064). Buffer strips are also widely recognized for a variety of functions, including streambank stabilization; erosion control; providing organic matter critical for aquatic organisms; serving as nutrient sinks for the surrounding watershed; water temperature control through shading; reducing flood peaks; and serving as key recharge points for renewing groundwater supplies (DeBano and Schmidt 1990; O'Laughlin and Belt 1995). If designed and managed properly, buffer strips also provide habitat for a large variety of plant and animal species.

BACKGROUND: Because of greater awareness of the importance of riparian areas, there has been an increase in requests for buffer strip and corridor design information by Corps Districts and Projects. Many of these requests relate to regulatory issues (e.g., protection of aquatic habitats and associated organisms, mitigation for loss or degradation of jurisdictional wetlands) such as Section 404 permitting under the Clean Water Act. Recent requests for information and technical assistance by Corps Districts on Section 404 permits involving buffer strips, and requests for additional information on buffer and corridor design criteria from Corps natural resources personnel attending Corps "PROSPECT" courses, indicate a strong need for better guidelines based on state-of-the-science criteria.

The Corps has recently made significant changes to the Nationwide Permit (NWP) system. On March 9, 2000, the Corps published in the Federal Register a final notice of changes to the NWP program. The Corps issued five new NWPs and modified six existing NWPs to replace NWP 26, which authorized discharges into nontidal headwaters and isolated waters. These modifications were designed to enhance protection of resources within 100-year floodplains. As part of the guidance under the new NWPs, both upland and riparian vegetated buffer strips can be mandated, in certain situations, by District Engineers as part of a Section 404 permit under the NWP system.

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1 Although the Corps does not have authority to directly regulate upland areas, there is authority that allows the Corps to consider vegetated buffer strips around wetlands and other waters of the United States (Federal Register, Vol. 65, No. 47, March 9, 2000). Buffer strips outside wetlands and waters of the United States are not an attempt to regulate uplands or to mitigate for impacts to uplands, but are a method available to the Corps to protect and minimize impacts to water quality and to aquatic habitats.

Figure 1. Riparian buffer strips provide numerous physical and ecological functions. Corps of Engineers Regulatory personnel should consider these functions when reviewing permitting decisions potentially affecting rivers, streams, and other aquatic systems (photograph of the Crystal River, Michigan)

The objective of this technical note is to identify technical and scientific considerations regarding upland and riparian buffer strips. Criteria for buffer strip designs are presented that can be considered when assessing the impacts of a proposed development on aquatic systems. Information for this report was primarily developed under the Corps' Ecosystem Management and Restoration Research Program (EMRRP).

WHAT ARE RIPARIAN AREAS? Riparian areas are transitional areas between aquatic and upland terrestrial habitats. They occur as long strips of vegetation adjacent to streams, rivers, lakes, reservoirs, and other aquatic systems that affect or are affected by the presence of water. They exist in a variety of landscape settings, including agricultural, forested, suburban, and urban areas. Although the Corps has specific guidelines to delineate jurisdictional wetlands, there are no such standardized criteria for delineating the boundaries of riparian areas. In fact, there is considerable widespread confusion in the literature and among scientists regarding where riparian areas end and "upland" areas begin (Fischer, Martin, and Fischenich 2000). Although jurisdictional wetlands can and do regularly occur within riparian areas, the entire riparian area typically is not comprised of wetlands.

The Corps provided the following definition[1] of vegetated buffers (also commonly known as buffer strips):

> A vegetated upland or wetland area next to rivers, streams, lakes, or other open waters which separates the open water from developed areas, including agricultural land. Vegetated buffers provide a variety of aquatic habitat functions and values (e.g., aquatic habitat for fish and other aquatic organisms, moderation of water temperature changes, and detritus for aquatic food webs) and help improve or maintain local water quality. A vegetated buffer can be established by maintaining an existing vegetated area or planting native trees, shrubs, and herbaceous plants on land next to open waters. Mowed lawns are not considered vegetated buffers because they provide little or no aquatic habitat functions and values. The establishment and maintenance of vegetated buffers is a method of compensatory mitigation that can be used in conjunction with the restoration, creation, enhancement, or preservation of aquatic habitats to ensure that activities authorized by NWPs result in minimal adverse effects to the aquatic environment.

Unfortunately, many riparian areas in North America are degraded to the point that they do not provide their natural or intended functions (e.g., protect water quality or provide wildlife habitat) (Welsch 1991). For example, various activities in uplands result in the movement of non-point source pollution (NPSP) (pesticides, herbicides, fertilizers, sediments) from upland to lowland areas. These pollutants typically are deposited directly into aquatic systems unless an adequate buffer strip intercepts them. This degradation also negatively affects many of the other important functions provided by riparian areas. The management and restoration of riparian corridors and buffer strips are becoming increasingly important options for improving water quality and conserving wildlife populations.

BUFFER STRIP CONSIDERATIONS DURING THE CORPS' REGULATORY REVIEW AND PERMITTING PROCESS

Are There Important Resources That Should be Protected or Conserved? A variety of factors can be considered by Corps regulatory offices during the decision to grant a 404 permit, including conservation, economics, aesthetics, wetlands, cultural values, navigation, fish and wildlife values, water supply, water quality, and other factors important to the public. The Corps "believes that establishing or maintaining existing vegetated buffers to open waters is critical to overall protection of the nation's aquatic ecosystems" (Federal Register 67(10), p. 2065). When decisions are made regarding the significance of a wetland or water body and its subsequent protection, the type and amount of NPSP associated with the proposed development are important considerations. For example, wetlands are often used as "biological filters" that can receive and very efficiently process some NPSP such as fertilizers. Buffer strips adjacent to wetlands designed to remove fertilizer may not need to be as wide as those around wetlands receiving other types of NPSP (e.g., high rates of sedimentation can fill wetlands and affect their ability to function properly). Conversely, NPSP flowing overland or below ground toward rivers, streams, and lakes without adequate buffer strips

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1 Definition is from the Regulatory Program of the U.S. Army Corps of Engineers, found in CFR 33 Part 330, Nationwide Permit Program, Final Notice of Issuance, Reissuance, and Modification of Nationwide Permits, March 9, 2000.

may be transported directly into the aquatic system, subsequently degrading water quality. Streams, rivers, and open water bodies do not have the ability to act as efficient filters for NPSP; thus, adequate buffer strips should be a consideration in these situations.

Riparian areas typically comprise a small percentage of the landscape, often less than 1 percent, yet they frequently harbor a disproportionately high number of wildlife species and perform a disparate number of ecological functions compared to most upland habitats. These strips of vegetation can provide habitat for a wide variety of plants and animals, provide a visual and noise buffer that reduces the disturbance of human developments on breeding and nesting birds, and provide corridors for movement from one habitat area to another (e.g., dispersing mammals, neotropical migrant birds using "stopover" habitat on their way to and from breeding grounds). Vegetation adjacent to streams and rivers also provides shading that moderates stream temperatures, and provides input of woody debris and other organic material important to aquatic organisms. Downed woody vegetation in the riparian area also provides microhabitats for reptiles, amphibians, and small mammals, and provides substrates for insects. Snags (dead, standing timber) within riparian areas provide cavities for a variety of birds and mammals. Encroachment into the riparian area during developments can negatively affect any or all of these important functions.

Riparian areas provide habitat for a large number of threatened and endangered species. Species such as the bald eagle (*Haliaeetus leucocephalus*) (Guilfoyle et al. 2000), the southwestern willow flycatcher (*Epidonax traillii extimus*), and least Bell's vireo (*Vireo bellii pusillus*) (Guilfoyle and Wolters 2001) have been major issues on some Corps project lands.

How wide should the buffer strip be? Unfortunately, there is no "one-size-fits-all" design for an ideal riparian buffer strip (Fischer and Fischenich 2000). Many factors including slope, soil type, adjacent land uses, floodplain, vegetation type, and watershed condition play a role in planning proper buffer strips.

If fish and wildlife populations are considered in the decision process, several recent scientific studies have recommended widths of buffer strips for different faunal groups. Riparian buffer strip width recommendations in these studies typically far exceed buffer strip width based solely on water quality (Fischer 1999; Fischer and Fischenich 2000). For example, the minimum recommended width of riparian buffer strips from most studies of avian populations is 100 m (300 ft). Other studies addressing ecological concerns associated with riparian buffer strips also tend to provide recommendations for buffer strips far in excess of what is typically recommended for water quality. While 100-m-wide buffer strips are not always possible, given the constraints of floodplain width, land ownership, and Corps statutory authority, the wider the buffer strip adjacent to a water body, the greater the potential for providing for more ecological functions.

When determining the appropriate design of vegetated buffers, one may consider the magnitude of the adverse effects on the aquatic system caused by the proposed development and require compensatory mitigation that will ensure that adverse effects are minimal. In most cases, buffer strips should at least extend the length of the riverbank or shoreline associated with the project or development. Continuous buffer strips may be more effective at moderating stream temperatures, reducing gaps in protection from NPSP, and providing better habitat and movement corridors for wildlife by reducing fragmentation.

What Are the Different Types of Buffer Strips That Can be Used to Protect Resources? The most commonly used type of buffer strip for water quality and wildlife is the riparian forest buffer. These buffer strips are usually comprised of a mixture of trees and shrubs. Filter strips, which are usually comprised of grasses and other herbaceous plants, are also commonly used, especially adjacent to agricultural fields. These two types of buffer strips sometimes are used in combination under a design called a three-zone buffer (Welsch 1991). Zone 1 begins at the edge of the active channel and is dominated by existing or planted native woody vegetation. This zone, which should remain free of disturbance, provides bank stabilization, coarse woody debris, stream shading, and habitat. Zone 2 is also forested and comprised of plant species similar to Zone 1. If water quality maintenance is a primary goal of the buffer strip, periodic vegetation removal in this zone (e.g., selection-cut timber harvest) can occur on a limited basis to maintain plant vigor that improves uptake of excess nutrients from NPSP. Zone 3 is the most proximal to uplands and should be comprised of native herbaceous vegetation (e.g., grasses and forbs) that facilitate sediment filtering, nutrient uptake, and the process of spreading flow of water from uplands evenly through the buffer strip.

What Should Comprise the Buffer Strip? When feasible, buffer strips should be planted with a mixture of native herbaceous and woody plants. Vegetation should be dense enough at ground level so that water entering the buffer from the upland spreads over the buffer strip instead of running through in channels and bypassing the filtering capacity of the vegetation (Dillaha et al. 1989). Woody plants, especially trees, are important components of an effective vegetated buffer. Seedlings and saplings of trees planted in the buffer strip tend to mature relatively quickly in the rich riparian soils, providing shade to the open waters, as well as substantial amounts of detritus that is an important component of aquatic food webs. Woody vegetation in riparian areas often slows the velocity of floodwaters, which can provide water quality benefits by allowing sediment to drop out of suspension and decrease the sediment load in the water column. Herbaceous vegetation can also be planted and allowed to succeed naturally into a woody plant community. While nonnative plant species may work just as well at controlling NPSP as native species, native plants are important for the habitat functions of vegetated buffers. Many nonnative plants are highly invasive, and can form dense monocultures that are not as high in value as native plants are for wildlife. There is also a great deal of interest in planting a mixture of native warm-season grasses (e.g., big bluestem, little bluestem, Indiangrass, switchgrass) instead of other popular cool-season grasses (e.g., reed canarygrass, Kentucky 31 tall fescue, orchardgrass, bluegrass) that have historically been recommended, but provide little or no value to wildlife.

Does the Position of the Proposed Development Within the Watershed Affect Design? Stream order and spatial placement of buffer strips within a watershed are important factors in determining the importance of a buffer strip, and can have a significant effect on water quality in a system. Although buffer strips are important along all river and stream reaches, those in headwater streams (i.e., those adjacent to first, second, and third order systems) often have much greater influences on overall water quality within a watershed than those buffers occurring in downstream reaches (Pallone and Todd 1997). Headwater streams, which usually occur at the highest elevations in the watershed, tend to comprise the majority of stream miles in a watershed, and thus, often receive the most NPSP. Buffer strips farther down the stream and river continuum have proportionally less impact on polluted water either already in, or entering, the system. Even the best buffer strips along larger rivers and streams cannot significantly improve water that has been degraded by im-

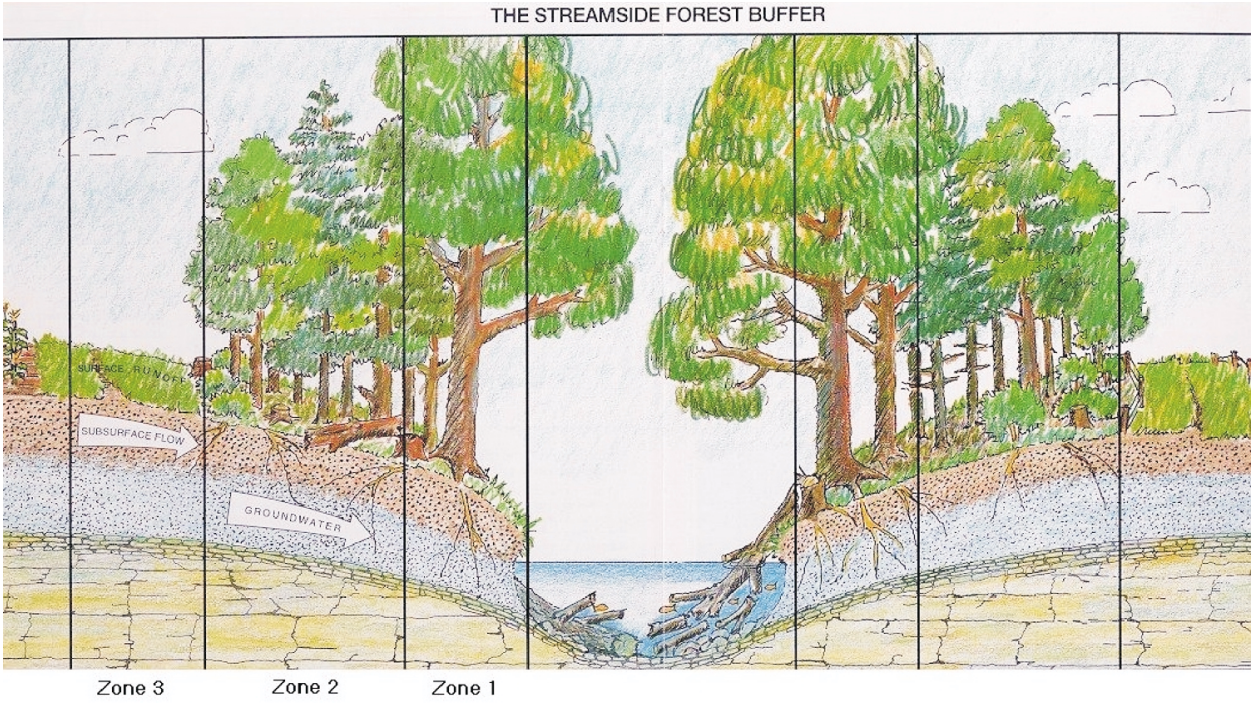

Figure 2. The three-zone buffer strip design (modified from Welsch (1991))

proper buffer practices higher in the watershed. However, buffer strips along larger systems should never be overlooked since they tend to be longer and wider than those along smaller systems, thus potentially providing better wildlife habitat and movement corridors (Lock and Naiman 1998).

CONCLUSIONS: Vegetated buffer strips provide numerous physical and ecological functions. There has been an increase in interest by the Corps in implementing improved buffer strip designs on project lands as well as in Regulatory review of Section 404 permit decisions. The Clean Water Act provides the Corps with legal authority during permit decisions to require vegetated buffer strips as part of the mitigation for impacts to wetlands and waters of the United States. Guidance on buffer strips was provided in the new and updated Nationwide Permits recently published by the Corps in the Federal Register. Some Corps Districts are using this and other scientific information to make improved decisions on Section 404 permits involving significant riparian habitats (see Table 1 for a checklist of considerations regarding buffer strips). Although most buffer strips are implemented for the maintenance or improvement of water quality, improved information is now available to enhance buffer strip designs for additional ecological benefits.

Table 1
Step-wise Buffer Strip Considerations

1. Determine if there are significant resources present that need to be protected or conserved by a buffer strip.	
2. Select the type of buffer strip for the situation.	Water quality concerns can be addressed in some instances with vegetated filter strips in uplands and riparian/wetland areas. Riparian forest buffer strips are more commonly used to provide for both water quality protection and conservation of natural resources. Review of proximal reference sites may assist in selecting type of buffer.
3. Select either a fixed-width buffer or a variable-width buffer.	Decision will be based on resources requiring protection. A variable-width buffer strip may be necessary at sites where some areas are more important than others.
4. Determine proper vegetation composition of the buffer strip.	Buffer strips may be comprised of a variety of native tree, shrub, and herbaceous species (Federal Register 67(10), p. 2093). Fischer and Fischenich (2000) provide a starting point for recommended vegetation.

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Appendix A: Case Studies

HUMBUG MARSH, MICHIGAN: In August 1999, the U.S. Army Engineer District, Detroit, requested that ERDC provide technical assistance in a controversial Section 404 permit review. The objectives were to assess the importance and effectiveness of existing buffer strips in providing wildlife habitat and protecting water quality at a proposed development site along approximately 1 mile of the Detroit River. The applicant's stated purpose for the development was to create a residential waterfront development with a nine-hole golf course. The proposed development consists of an 8-hectare (ha) island (Humbug Island), a 93-ha mainland area, and 72 ha of water and associated wetlands.

Several years ago, a 45-ha area along the mainland of Humbug Marsh was obtained by a private company as mitigation for an unrelated action. This company was directed to establish a conservation easement on the property to include an 18-m upland buffer to protect associated wetlands; this action was insisted upon by the Environmental Protection Agency, U.S. Fish and Wildlife Service, and Michigan Department of Natural Resources. The property was later purchased by another company that applied for a 404 permit to fill wetlands as part of a residential and golf course development for the site. This company subsequently bush hogged much of the property, including an approximately 640-m-long buffer strip that was protected by conservation easement. Prior to vegetation removal, much of the easement was comprised of riparian vegetation that provided a transitional zone between aquatic and upland habitats.

The lower Detroit River, including Humbug Marsh, is considered the most important fish spawning and nursery habitat in the entire Detroit River and much of Lake Erie. Humbug Marsh is recognized as a significant spawning and nursery area for forage fishes and contributes to a regionally important walleye (*Stizostedion vitreum*) fishery. The marsh and associated vegetation also serve as habitat for a variety of waterfowl, wading birds, raptors, passerines, and shorebirds. The vegetation on Humbug Island is diverse, the canopy is unfragmented, and there are numerous snags and downed trees that contribute to the value of the island for wildlife. Natural vegetation along the mainland serves as a buffer strip that protects wetlands and the river from upland disturbances, and provides wildlife habitat or a diversity of fauna.

Assessment by ERDC. After conducting a site evaluation and investigating the literature and other sources of information, ERDC concluded that the 18-m buffer strip likely was inadequate in providing proper buffering function from upland development, especially after the bush hogging operation, and would not be able to provide functions required to support healthy wildlife populations in the riparian area and associated wetlands. ERDC made the following recommendations in regard to riparian buffers and the Humburg Marsh complex:

- Buffer strips comprised of native uncut vegetation at least 30 m wide should be provided to adequately protect wetland and aquatic habitats from potential NPSP from upland developments.
- Buffer strips at least 100 m wide should be established to provide adequate wildlife habitat and movement corridors.
- Impacts of the clearing operation conducted in the conservation easement should be offset by rehabilitating the existing easement area with plantings of preferred wildlife trees (e.g., oak

[*Quercus* spp.], hickory [*Carya* spp.]) and native shrubs, and by extending the width of the buffer strip to reclaim habitat lost by the clearing operation.
- No development should be allowed on Humbug Island. Disturbances to the island could be especially detrimental to fisheries because of the relatively narrow wetland fringe that buffers aquatic areas from the adjacent upland, and to migrant birds that use the Detroit River as a migration corridor during spring and fall.

Findings in the Corps' Environmental Assessment.

Impacts to riparian areas, wetlands, and aquatic systems. The overall site is a relatively rare and unique habitat and is one of the few remaining vestiges of a habitat that was once regionally abundant. Wildlife impacts on the site are potentially the most significant adverse impact associated with the project. The project, specifically clearing of the riparian area, would eliminate or significantly alter reproductive, foraging, and resting habitat, and interrupt a travel corridor for upland game birds, waterfowl, wading birds, shorebirds, songbirds, small and large mammals, reptiles, amphibians, and invertebrates that are important in the food chain. A proposed causeway allowing access to and development of the island, would create some upland habitat. However, the exchange of upland habitat for increasingly rare riparian habitat in the area would lead to an overall decrease in terrestrial biota diversity and productivity.

Impacts to uplands. The vast majority of uplands on the mainland and island occur outside of direct Corps jurisdiction. However, activities associated with the development would require discharges of dredged and fill materials for upland access and thus come within Corps control and responsibility. The Corps of Engineers can require vegetated upland buffers adjacent to open waters of the United States as part of a Clean Water Act Section 404 permit, since these buffers provide many of same functions as wetland buffer strips.

Proposed construction of the residential development and golf course would remove existing habitat in the wetland impact areas and over most of the uplands on the site. This would cause a substantial long-term adverse impact on nesting, feeding, and resting habitat for waterfowl, wading birds, shorebirds, and songbirds, as well as for small and large mammals. Human activity, including noise and vehicle movement associated with these developments, would displace wildlife that currently inhabit the site and those that use uplands for roosting, resting, rearing, and the foraging habitat. Development of the uplands on the island and the mainland would destroy a large area that is currently used by many species of migratory songbirds and other types of birds. Current research on migratory songbirds has focused on habitat loss all along their migration routes as one of several factors contributing to declining populations.

Clearing of vegetation in uplands, even with an 18-m buffer strip, would lead to an increase in construction and subsequent occupation of housing. This would potentially lead to an increase in stress and/or exclusion of wildlife species sensitive to disturbance, including some migrating waterfowl, eagles and osprey, and other birds. Only those species or individuals that tolerate these activities will use the area. These conclusions would extend to mammals, as well.

The Detroit District recommended the following proposed alternatives that would meet Section 404(b)1 guidelines:

- Full application of ERDC's 100-m recommendation to all areas including the island, the mainland shoreline along the open water, adjacent wetlands, and to all wetland pockets and fingers within the upland portion of the site. This will minimize adverse impacts to aquatic resources and preserve wildlife habitat.
- Requirement of a 45-m buffer along a section of the shoreline. This will protect slightly less valuable shoreline areas.

Final Decision. The proposed development was not in the overall public interest, and did not comply with Section 404(b)(1) guidelines as interpreted by the District Commander, Detroit. The District found there would be major long- and short-term negative impacts on aquatic plants and animals as a result of the proposed work. Negative impacts would be greatly reduced if the permit were denied, modified to exclude the island causeway (and therefore the island development), and/or issued with special conditions to require a substantial buffer strip in common ownership, and to control turbidity during and after construction. Special conditions that would establish easements/buffer strips of sufficient width to preserve wildlife use levels within the waterway, wetlands, and an appropriately sized upland buffer could decrease secondary impacts of development. It would be crucial to maintain easements/buffers in one ownership to increase enforceability.

CRYSTAL RIVER, MICHIGAN: The ERDC also assisted the U.S. Army Engineer District, Detroit in assessing the values and potential impacts of a proposed 18-hole golf course development within and adjacent to the riparian area associated with the Crystal River in northern Michigan. The developer proposed two different plans for constructing an 18-hole golf course on the property. The first plan was to construct the course with 4 holes located within the riparian area of the Crystal River, and the remaining 14 holes interspersed among upland and wetlands. An alternative plan proposed that all 18 holes be kept out of the riparian area; however, this plan included a housing development within the Crystal River riparian area. The primary issues and concerns associated with the proposed development were the potential impacts to the ecology of riparian habitat adjacent to the Crystal River, and potential impacts to water quality within the river and adjacent wetlands. Objectives of the ERDC were to evaluate potential impacts to riparian zone habitat associated with the Crystal River, and evaluate the approach taken by the applicant's consultant using the Pesticide Root Zone Model (PRZM), which addressed potential transport of NPSP to the river.

The Crystal River is a highly sinuous system that flows from the southern end of Glen Lake approximately 15 river miles before entering Lake Michigan. The river meanders through topography comprised primarily of a series of dunes and swales, characterized as the "Wooded Dune and Swale Complex" by the Michigan Natural Features Inventory. This natural community type apparently is unique to the Lower Peninsula of Michigan. The river is heavily used for recreational canoeing during summer months.

Assessment by ERDC. After conducting a site evaluation and investigating the literature and other sources of information, ERDC concluded that the proposed development within the riparian area of the Crystal River (including both proposed alternatives) would have negative consequences to the ecology of the system, and negatively impact water quality in the river.

Impacts to Riparian Habitat. Construction and development of the four holes in the riparian area would involve significant clearing of riparian vegetation. Two of the holes would occur entirely on

one side or the other of the river and run parallel to the river channel; a third hole would have golfers teeing off directly across the river from the tee box; the fourth hole parallels the river but golfers would tee off directly upstream to another fairway paralleling the river.

The loss of riparian habitat on the proposed site may appear insignificant because of the relatively small amount of acreage proposed for conversion. However, the loss of habitat along the river would create a fragmented riparian corridor leading to a break in continuity that many organisms require for movements among habitats. Based on habitat characteristics observed during a site visit, the site likely supports a diversity of animal life, including numerous species of breeding and wintering birds, reptiles, amphibians, large and small mammals, and invertebrates. The site also likely provides suitable habitat for a diversity of both neotropical and nearctic migrant birds as they move to and from seasonal ranges. Due to the relatively undisturbed habitat present on the site, the juxtaposition of both upland ridges and wetland swales, and the proximity of open water in the Crystal River, any clearing or development within the proposed site will substantially reduce or eliminate suitable habitat for many species of plants and animals.

Effects on Water Quality. Pesticides applied to golf courses to control weeds, insects, burrowing mammals, and other pest species have proven to be harmful to wildlife. Several examples of direct and indirect effects of pesticides on wildlife were cited in an ERDC report to the District. The PRZM was used by the applicant to assess the extent to which pesticides could leach through the soil profile, reach groundwater, and move offsite (i.e., into the Crystal River). Either plan appears to have nearly the same golf course surface area for application of fertilizers, herbicides, and pesticides. The alternative plan replaces the impact of a golf course with a housing project.

There are potential water quality impacts associated with housing developments in the riparian zone. First, construction will disrupt soil that likely will run off into adjacent wetlands and the river channel. Second, any lawns associated with homes will likely be treated with fertilizers, herbicides, and pesticides. The use of these chemicals typically is not regulated under conditions used at most golf courses. Third, if septic systems are constructed for these homes, there is potential for movement of wastewater into wetlands (and groundwater) and the river channel. Finally, construction of housing, roads, and driveways will increase the amount of impervious surface area potentially impacting surface water quality and quantity entering wetlands and the Crystal River.

Findings in the Corps' Environmental Assessment.

Impact on riparian habitat. The project would have major, long-term, negative impacts on the terrestrial and aquatic biota. Construction along the shoreline would eliminate/alter habitat for amphibious animals and other organisms that require the natural land-water transitional habitat. A variety of organisms would be displaced from their habitat by impacts of the proposed construction and resulting use. Housing development would have a greater impact than a golf course development. The newly created landscaped upland would furnish habitat for those few species adapted to uplands.

Implementation of the proposed activity would impact upon the ecology and integrity of valuable resources: wetlands, migratory bird stopover and foraging point, globally rare habitat limited to the Great Lakes region and of national and international significance. Although the entire site is clearly

of high quality and significance, the value of the riparian habitat is considerably higher than habitats outside the riparian zone.

Impacts on water quality. The Detroit District found that the work would negatively impact an area that filters rainfall, runoff, groundwater, and floodwaters that would otherwise directly enter the waterway, and would replace it with a new source area for runoff pollutants (e.g., lawn fertilizers, herbicides, pesticides, road salt, oil, grease, and septic runoff/leachate). This would cause a long-term negative impact on water quality. Reductions of riparian vegetation along the waterway would cause major adverse impacts to water chemistry, temperature, and turbidity. Failure of septic systems would result in very serious and very likely significant, adverse impacts to water quality.

Clearing and fertilization within the riparian area, particularly within 30 m of the river, would have the greatest potential impact. Inclusion of substantial riparian buffers and avoidance of the riparian area of the Crystal River would substantially reduce, but not eliminate, the potential for significant impact.

Final Decision. Both of the proposed alternative designs for the golf course and housing development were not in the overall public interest, and did not comply with Section 404(b)(1) guidelines as designed. The DE stated that although the applicant's preferred alternative, which was development of a course located within and adjacent to the Crystal River riparian zone, would have benefits to economics and rights of property ownership, it would have significant adverse impacts on conservation and overall ecology, terrestrial biota, wetlands, visual aesthetics, recreation, safety, and designated scenic and recreational values. Additionally, the cumulative impact of the loss of riparian habitat would be significant. The DE also suggested the proposed development would have significant impact to water quality and the aquatic biota, have potential adverse impacts on water supply and conservation, and be contrary to the Section 404(b)(1) guidelines.

The District Engineer did recommend an alternative that would not be contrary to the overall public interest and would meet Section 404(b) (1) guidelines:

- Confining the entire course to an area outside of the riparian zone of the Crystal River.
- Mitigating to include the permanent conservation of approximately 47 acres of land within and adjacent to the Crystal River riparian zone (owned or controlled by the applicant).
- Developing a detailed, enforceable water quality monitoring plan.
- Further reducing the wetland impact and avoidance of the riparian corridor in other areas of the proposed project.

APPENDIX C

Section 303d Listed Waters

TMDL TARGET DATE(S)++	NOTE	BASIN	HUC	STATION	LOCATION	COUNTY	USE	CAUSE
2021		CATAWBA	030501040304	CW-019	WATEREE RVR AT US 1	KERSHAW	AL	DO
2014		CATAWBA	030501040304	CW-214	WATEREE RIVER @ I-20	KERSHAW	AL	DO
2025		CATAWBA	030501040304	CW-214	WATEREE RVR AT I-20	KERSHAW	FISH	HG
2014		CATAWBA	030501040305	CW-082	SWIFT CK AT S-28-12	KERSHAW	AL	DO
2014		CATAWBA	030501040305	CW-082	SWIFT CK AT S-28-12	KERSHAW	REC	FC
2019, 2014		CATAWBA	030501040305	CW-238	SWIFT CK AT SC 261	KERSHAW	AL	CU, DO
2024		CATAWBA	030501040404	CW-250	COLONELS CK AT SC 262	RICHLAND	AL	CU
2025		CATAWBA	030501040406	CW-206	WATEREE RVR AT US 76 & 378	SUMTER	FISH	HG
2021		EDISTO	030502030101	E-606	CHINQUAPIN CREEK AT S-02-210	AIKEN	AL	BIO
2025		EDISTO	030502030106	E-102	N FORK EDISTO RVR AT S-02-110	BAMBERG	FISH	HG
2017		EDISTO	030502030206	E-034	BULL SWP CK AT CLVT ON UNIMP RD 1.1 MI NW OF SWANSEA	LEXINGTON	AL	DO
2018		EDISTO	030502030206	E-591	BULL SWAMP CREEK AT SC 6	LEXINGTON	AL	BIO
2025		EDISTO	030502030210	E-704	NORTH EDISTO RIVER @ SLAB LANDING	ORANGEBURG	FISH	HG
2013	*, #	EDISTO	030502030308	E-007	N FORK EDISTO RVR AT US 601 AT ORANGEBURG	ORANGEBURG	AL	PH
2025	*	EDISTO	030502030308	E-007	N FORK EDISTO RVR AT US 601 AT ORANGEBURG	ORANGEBURG	FISH	HG
2025		EDISTO	030502030308	E-007C	N FORK EDISTO RVR AT POLICEMANS CAMP 6 MI BL E-007	ORANGEBURG	FISH	HG
2025		EDISTO	030502030308	E-008	N FORK EDISTO RVR AT S-38-39 WSW OF ROWESVILLE	ORANGEBURG	FISH	HG
2025		EDISTO	030502030308	E-008A	N FORK EDISTO RVR AT S-38-63	ORANGEBURG	FISH	HG
2016		EDISTO	030502040106	RS-03344	HILLYER BRANCH AT UNNAMED HILLYER BRANCH ROAD OFF S-19-75 3.5 MI NE OF TRENTON	EDGEFIELD	AL	PH
2024		EDISTO	030502040109	E-113	S FORK EDISTO RVR AT S-02-152	AIKEN	AL	DO
2025		EDISTO	030502040207	E-585	SOUTH EDISTO RIVER @ AIKEN STATE PARK	AIKEN	FISH	HG
2025		EDISTO	030502040207	E-600	LIGHTWOOD KNOT CRK. AT UNNAMED RD. WEST OF SR 60	AIKEN	FISH	HG
2023		EDISTO	030502040305	E-029	WINDY HILL CRK. AT SR 38	BARNWELL	AL	PH
2025		EDISTO	030502040307	E-011	S FORK EDISTO RVR AT SC 39	BARNWELL	FISH	HG
2016		EDISTO	030502040309	E-592	ROBERTS SWAMP AT SR 690	ORANGEBURG	AL	BIO
2025		EDISTO	030502040311	E-500	SOUTH EDISTO RIVER @ BOBCAT LANDING	BAMBERG	FISH	HG
2025		EDISTO	030502040311	E-501	SOUTH EDISTO RIVER @ SC 365	BAMBERG	FISH	HG
2012	*	EDISTO	030502050101	E-076	LITTLE BULL CK CK AT SC 33-BL UTICA TOOL CO	ORANGEBURG	AL	PH
2018		EDISTO	030502050101	E-589	GRAMBLING CRK. AT SR 154	ORANGEBURG	AL	BIO
2018		EDISTO	030502050101	E-590	BULL SWAMP AT SR 65	ORANGEBURG	AL	BIO
2016		EDISTO	030502050105	RS-01036	GOODBYS SWAMP AT US 176 6 M SW OF ELLOREE	ORANGEBURG	AL	BIO
2025		EDISTO	030502050108	E-048	FOUR HOLE SWAMP @ US 301	ORANGEBURG	FISH	HG
2025		EDISTO	030502050108	E-059	FOUR HOLE SWP AT S-38-50 5.2 MI SE OF CAMERON	CALHOUN	FISH	HG

TMDL TARGET DATE(S)++	NOTE	BASIN	HUC	STATION	LOCATION	COUNTY	USE	CAUSE
2020		PEEDEE	030402010902	PD-639	JEFFERIES CREEK AT S-16-13	DARLINGTON	AL	BIO
2023		PEEDEE	030402010903	RS-07205	POLK SWAMP AT S-21-918 (OLD WALLACE RD) 5.75 MI ESE OF FLORENCE	FLORENCE	REC	FC
2012	*	PEEDEE	030402010904	PD-167	WILLOW CREEK AT S-21-57	FLORENCE	REC	FC
2015		PEEDEE	030402010904	PD-630	WILLOW CREEK AT SC 327	FLORENCE	AL	BIO
2013	*	PEEDEE	030402010905	PD-035	JEFFERIES CK AT SC 327 AT CLAUSSEN	FLORENCE	REC	FC
2025		PEEDEE	030402011003	PD-337	GREAT PEE DEE RVR AT US 301/76	MARION	FISH	HG
2017		PEEDEE	030402011102	PD-187	SMITH SWP AT US 501 1.9 MI SSE OF MARION	MARION	AL	DO
2017		PEEDEE	030402011102	PD-320	SMITH SWP AT S-34-19 1 MI E OF MARION	MARION	AL	DO
2013	*	PEEDEE	030402011105	PD-097	CATFISH CANAL AT S-34-34 6 MI SW OF MARION	MARION	AL	DO
2021		PEEDEE	030402011105	PD-097	CATFISH CANAL AT S-34-34 6 MI SW OF MARION	MARION	REC	FC
2025		PEEDEE	030402011201	PD-622	GREAT PEE DEE RIVER @ DEWITT BLUFF	FLORENCE	FISH	HG
2025		PEEDEE	030402011202	PD-076	GREAT PEE DEE RVR AT US 378	FLORENCE	FISH	HG
2025		PEEDEE	030402011202	PD-662	GREAT PEE DEE RIVER @ BOSTICK	FLORENCE	FISH	HG
2019		PEEDEE	030402020101	PD-333	HILLS CREEK AT S-13-105	CHESTERFIELD	AL	BIO
2019		PEEDEE	030402020103	PD-679	NORTH BRANCH OF WILDCAT CRK. AT SR 178	LANCASTER	AL	BIO
2019	#	PEEDEE	030402020104	PD-182	FLAT CR. AT US 601	LANCASTER	AL	BIO
2019		PEEDEE	030402020104	RS-08233	FLAT CREEK AT S-29-99	LANCASTER	AL	BIO
2019		PEEDEE	030402020105	PD-366	HILLS CREEK AT S-13-545	CHESTERFIELD	AL	BIO
2013	*	PEEDEE	030402020201	PD-335	HORTON CREEK AT S-29-95	LANCASTER	REC	FC
2019		PEEDEE	030402020201	PD-640	LITTLE LYNCHES R. AT SR 88	LANCASTER	AL	BIO
2023		PEEDEE	030402020202	PD-669	HANGING ROCK CRK. AT SR 770	LANCASTER	AL	PH
2013	*	PEEDEE	030402020202	RS-04549	UNNAMED TRIBUTARY TO HANGING ROCK CREEK AT CULVERT ON CO RD S-29-773, 3.25 MI SSE OF KERSHAW.	LANCASTER	REC	FC
2013	*	PEEDEE	030402020203	PD-006	LITTLE LYNCHES RVR AT US 601 2 MI NE KERSHAW	LANCASTER	REC	FC
2019		PEEDEE	030402020203	PD-632	LITTLE LYNCHES R. AT SC 157	LANCASTER	AL	BIO
2015		PEEDEE	030402020301	PD-068	FORK CK AT UN# RD 1.5 MI SW JEFFERSON	CHESTERFIELD	AL	BIO
2015		PEEDEE	030402020301	PD-647	LITTLE FORK CRK. AT CO.RD. 39 UPSTREAM OF BREWER GOLD MINE	CHESTERFIELD	AL	BIO
2013	*	PEEDEE	030402020403	PD-229	NEWMAN SWP AT S-16-449 0.9 MI NE OF LAMAR	DARLINGTON	AL	DO
2019		PEEDEE	030402020405	RS-04548	SPARROW SWAMP AT US 76 1.1 MI SOUTHWEST OF TIMMONSVILLE. SITE IS A USGS GAUGING SITE.	FLORENCE	AL	CR, CU, NI
2019		PEEDEE	030402020406	PD-345	LAKE SWAMP AT S-21-38	FLORENCE	REC	FC

TMDL TARGET DATE(S)++	NOTE	BASIN	HUC	STATION	LOCATION	COUNTY	USE	CAUSE
2023		PEEDEE	030402020408	PD-332	SPARROW SWAMP AT S-21-55 NR JOHNSONS CROSSROADS	FLORENCE	REC	FC
2025		PEEDEE	030402020503	PD-071	LYNCHES RVR AT US 15/SC 34	LEE	FISH	HG
2023		PEEDEE	030402020503	PD-112	COUSAR BR 1/4 MI BELOW BISHOPVILLE FINISHING CO	LEE	REC	FC
2025		PEEDEE	030402020504	PD-364	LYNCHES RIVER AT US 401	LEE	FISH	HG
2023		PEEDEE	030402020504	PD-364	LYNCHES RIVER @ SC 401	LEE	REC	FC
2015		PEEDEE	030402020601	PD-346	CAMP BRANCH AT S-21-278	FLORENCE	AL	DO
2013	*	PEEDEE	030402020601	PD-346	CAMP BRANCH AT S-21-278	FLORENCE	REC	FC
2015		PEEDEE	030402020602	PD-314	SINGLETON SWAMP AT S-21-67	FLORENCE	AL	DO
2015		PEEDEE	030402020602	RS-10397	LONG BRANCH AT CULVERT AT MOULDS RD. THIS CULVERT IS AT THE END OF PAVEMENT COMING FROM BEULAH RD	FLORENCE	REC	FC
2023		PEEDEE	030402020603	PD-085	LAKE SWAMP AT US 378	FLORENCE	AL	DO
2019		PEEDEE	030402020603	PD-086A	LAKE SWAMP ON SC 341	FLORENCE	AL	DO
2023		PEEDEE	030402020603	PD-086A	LAKE SWAMP ON SC 341	FLORENCE	REC	FC
2013	*	PEEDEE	030402020701	PD-041	LYNCHES RVR AT US 52 NEAR EFFINGHAM	FLORENCE	AL	PH
2023		PEEDEE	030402020701	PD-041	LYNCHES RVR AT US 52 NEAR EFFINGHAM	FLORENCE	REC	FC
2025		PEEDEE	030402020701	PD-624	LYNCHES RIVER @ US 52	FLORENCE	FISH	HG
2013	*	PEEDEE	030402020703	PD-169	BIG SWP AT US 378 & SC 51 0.9 MI W OF SALEM	FLORENCE	AL	DO
2025		PEEDEE	030402020705	PD-048	LYNCHES RIVER @ JOHNSONVILLE	FLORENCE	FISH	HG
2021		PEEDEE	030402031302	PD-368	BEAR SWAMP AT S-17-56	DILLON	REC	FC
2021		PEEDEE	030402031404	PD-038	LUMBER RIVER @ RICEFIELD COVE	HORRY	AL	DO
2025		PEEDEE	030402031404	PD-038	LUMBER RVR AT US 76 AT NICHOLS	HORRY	FISH	HG
2021		PEEDEE	030402031404	PD-038	LUMBER RIVER @ RICEFIELD COVE	HORRY	REC	FC
2025		PEEDEE	030402031404	PD-664	LUMBER RIVER @ CAUSEY LANDING	HORRY	FISH	HG
2014		PEEDEE	030402040404	PD-349	BUCK SWAMP AT S-17-42	DILLON	AL	DO
2025		PEEDEE	030402040504	PD-283	LITTLE PEE DEE RIVER @ MOCOCASIN'S BLUFF	DILLON	FISH	HG
2025		PEEDEE	030402040506	PD-030A	LITTLE PEE DEE RVR BELOW JCT WITH MAPLE SWP	DILLON	FISH	HG
2025		PEEDEE	030402040506	PD-618	LITTLE PEE DEE RIVER @ FLOYDALE BRIDGE	DILLON	FISH	HG
2021		PEEDEE	030402040507	PD-348	LITTLE PEE DEE RIVER AT S-17-72	DILLON	AL	DO
2021		PEEDEE	030402040508	PD-052	LITTLE PEE DEE AT S-34-60	MARION	AL	DO
2025		PEEDEE	030402040508	PD-053	LITTLE PEE DEE RIVER @ GILCREST LANDING	MARION	FISH	HG
2022		PEEDEE	030402040601	RS-06009	BOB'S BRANCH AT BRIDGE ON S-26-637 2.2 MI N OF GREEN SEA	HORRY	AL	DO
2014		PEEDEE	030402040604	PD-176	LAKE SWAMP AT S-26-99	Horry	REC	FC
2014		PEEDEE	030402040604	RS-03513	LOOSING SWAMP AT S-26-23 3.7 MI NE OF AYNOR	HORRY	AL	DO

APPENDIX D

Carolina Heelsplitter Survey

and

Habitat Assessment in Flat Creek

CAROLINA HEELSPLITTER SURVEY AND HABITAT ASSESSMENT IN FLAT CREEK

Prepared for

ENVIRONMENTAL BANC & EXCHANGE
PURCHASE ORDER NUMBER: 1151

by
John M. Alderman
Alderman Environmental Services, Inc.
Pittsboro, NC

DRAFT DOCUMENT

31 March 2007

Table of Contents

Introduction

The Carolina heelsplitter (*Lasmigona decorata*) is a federally listed endangered freshwater mussel species with 11 extant populations within the following river basins: Savannah River Basin (Cuffytown and Turkey creeks), Santee Cooper River Basin (Rocky Creek, Fishing Creek, Gills Creek, Waxhaw Creek, Cane Creek, Red Bank Creek, and Six Mile Creek), and Pee Dee River Basin (Lynches River and Goose Creek). Each population is small, isolated, and highly vulnerable to extirpation.

Environmental Banc & Exchange contracted with Alderman Environmental Services, Inc. to complete surveys for the Carolina heelsplitter in Flat Creek and provide recommendations for habitat/landscape management.

Methods

In general, surveys were completed under good conditions with the water low, slightly turbid, and substrates free of detritus. Visual, tactile, and assisted visual using batiscopes were used to survey for *L. decorata* within streams associated with proposed EBX properties and within Flat Creek below the Constable Road (S-99) bridge crossing (Figure 1).

Landscapes and habitats associated with proposed EBX properties were assessed for needed habitat improvements.

Results and Discussion

Survey station results are provided within the appendix.

One live and 1 shell of *L. decorata* were documented associated with proposed EBX properties downcreek from Overbrook Road in Flat Creek. The live individual was 47 mm in length (smallest of all *L. decorata* observed during current study); therefore, this represents recent reproduction within this creek reach. Additionally, 14 live *L. decorata* were documented within Flat Creek downcreek from Constable Road (S-99). At least 6 age classes are represented within the group of 15 live *L. decorata* observed in Flat Creek. Location, length, and tag data are provided in Table 1. Given that the species is relatively common in Flat Creek near Constable Road, and several age classes are present within the subbasin, this population of *L. decorata* should be considered viable. Pictures of all *L. decorata* documented from this study are provided in Figures 2 – 6.

As seen in many Piedmont creeks in North and South Carolina, the upper reaches of Flat Creek are presently downcutting through accumulated sediments produced by past agricultural and silvicultural landuses. The resulting incised creek within these areas not only cuts downward but also laterally, thus causing unstable banks and significant instream sedimentation (Figure 7 from Flat Creek downcreek from Overbrook Road). In time, Flat Creek within these "unstable" reaches will reach bedrock, and the creek banks will stabilize (Figure 8 from lower Flat Creek downcreek from Constable Road). Long term landscape conservation throughout the Flat Creek Subbasin will help accelerate this

process toward having stable creek banks throughout the subbasin. The most important conservation strategy for the Carolina heelsplitter is to acquire and properly manage as much land as possible within the subbasin.

Management Recommendations

Figures 9 and 10 identify areas where management may be necessary to improve aquatic habitats associated with potential EBX properties along Flat Creek and its tributaries:

Project 1. Replant food plot in terrace plain, replant access road to top of hill; and add water bars to road. Location: 34.67476 N, 80.53998 W

Project 2. Add water bars to road running up 2 hills; close road; and revegetate road. Intermittent stream at this location needs structure to transmit flows to be level spread into the Flat Creek terrace plain. Location: 34.67125 N, 80.54083 W.

Project 3. Close road in terrace plain and revegetate with native mast producing trees. Location: 34.67007 N, 80.53909 W

Project 4. Level spread tributary stream flows into Flat Creek terrace plain. Location: 34.67052 N, 80.53980 W.

Project 5. Close road and replant along terrace plain.

Project 6. Close road and replant down to food plot in terrace plain.

Project 7. Replant food plot in terrace plain. Location: 34.66513 N, 80.53893 W

Project 8. Remove road; put in water bars to level spread stormwater into landscape; replant road. Uphill extent of road to be removed is at 34.66397 N, 80.54408 W.

Project 9. Remove road from areas within or near Flat Creek terrace plain; add water bars; replant.

Project 10. The roadside ditch system is draining into an unnamed tributary. Level spread stormwater into proposed EBX property instead of having direct discharge in the unnamed tributary. Location: 34.70549 N, 80.54346 W.

Project 11. The same situation seen at project 10 exists here; however, at this site, turkey farm runoff is being carried by the unnamed tributary (extremely high nutrient load). The same recommendations apply to this project. Location: 34.70414 N, 80.54591 W.

Project 12. Apply same principles as seen in project 10. Location: 34.70173 N, 80.54797 W.

Project 13. There is direct discharge of road ditch runoff to Little Double Branch. Stormwater needs to be diverted and level spread into the landscape.
Location: 34.69900 N, 80.55105 W.

Project 14. Extremely serious erosion and sedimentation issues occur at this road crossing of Big Double Branch. There is direct discharge of road ditch runoff to Big Double Branch. Stormwater needs to be diverted and level spread into the landscape.
Location: 34.69655 N, 80.55679 W.

Project 15. The road crossing of this tributary needs to be better managed. Location: 34.69812 N, 80.54717 W.

Project 16. This part of the on property road network needs to be removed, to have water bars added, and to be replanted in native vegetation. Significant erosion, sedimentation, direct stream impacts, and riparian corridor impacts exist within this part of the road network. Most of the game stands associated with this part of the road

network can be accessed from other nearby roads. The terminal points are located near game stands 43, 6, and 14. One terminus is located at 34.68795 N, 80.55180 W.

Project 17. It appears that the road crossing this tributary to Little Double Branch is managed by Lancaster County. Discussions should be held with the managers of this road to consider road removal or better road management to prevent direct discharge of road ditch runoff into the tributary.

General Management Recommendations. Food plots located within 200 feet, measured horizontally, of any perennial stream should be revegetated with native, mast producing trees. All large fields on the property should be allowed to pass through succession to produce a mature, relatively natural woodland. It may be of value to accelerate this process by planting hardwoods within these fields.

If financial resources are available to maintain the road associated with projects 5 and 8, it may be possible to maintain this road for future use.

Table 1. Live *Lasmigona decorata* specimens observed from Flat Creek during the present study

STATION	DATE	NORTH LATITUDE	WEST LONGITUDE	TAG 1	TAG 2	LENGTH (MM)	PICTURE
070314.2	3/14/07	34.67082	80.53949	M342	M343	47	X
070321.1	3/21/07	34.63368	80.46285	M344	M345	86	X
070321.1	3/21/07	34.63368	80.46285	M346	M347	68	X
070321.1	3/21/07	34.63368	80.46285	M348	M349	54	X
070321.1	3/21/07	34.63368	80.46285	M350	M351	82	X
070321.1	3/21/07	34.63368	80.46285	M352	M353	61	X
070321.2	3/21/07	34.63229	80.45631	M354	M355	78	X
070321.2	3/21/07	34.63229	80.45631	M356	M371	74	X
070321.2	3/21/07	34.63229	80.45631	M358	M357	68	X
070321.2	3/21/07	34.63229	80.45631	M360	M359	76	X
070321.2	3/21/07	34.63229	80.45631	M362	M361	58	X
070321.2	3/21/07	34.63229	80.45631	M364	M363	63	X
070321.2	3/21/07	34.63229	80.45631	M366	M365	60	X
070321.2	3/21/07	34.63229	80.45631	M368	M367	71	X
070321.2	3/21/07	34.63229	80.45631	M370	M369	62	X

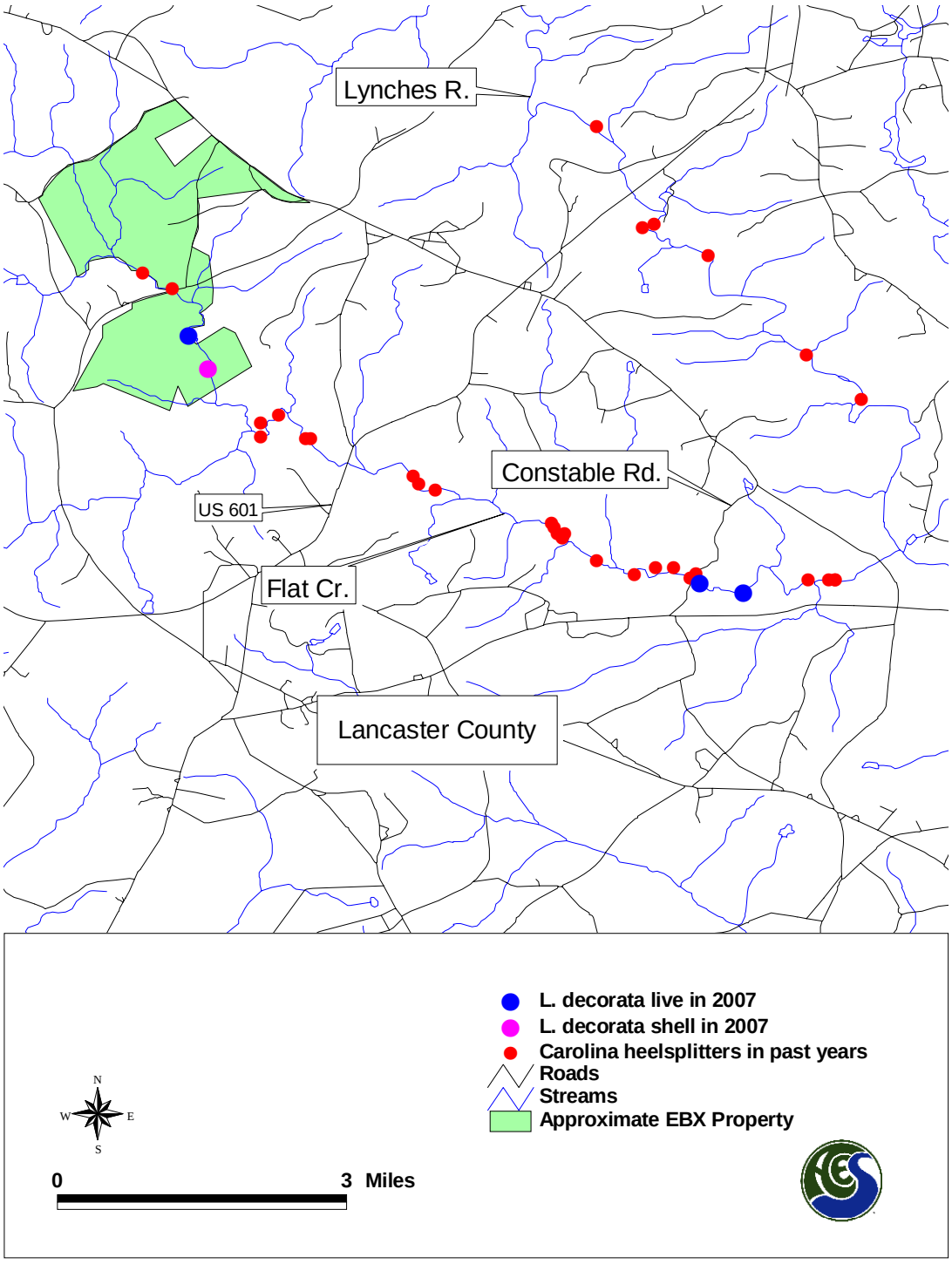

Figure 1. *Lasmigona decorata* confirmed locations in 2007 and from past surveys

Figure 2. Shell of *L. decorata* associated with proposed EBX property

Figure 3. Live *L. decorata* associated with proposed EXB property

Figure 4. Specimens of *L. decorata* observed within first survey station (20070321.1jma) downcreek from Constable Road. Note: Specimen with observed tag number M344 has holes present on both valves near the umbos. This animal will probably die in the near future.

Figure 5. Six of 9 live specimens of *L. decorata* observed within second survey station (20070321.2jma) downcreek from Constable Road

Figure 6. Three of 9 live specimens of *L. decorata* observed within second survey station (20070321.2jma) downcreek from Constable Road

Figure 7. Typical unstable banks within upper incised reaches of Flat Creek

Figure 8. Typical stable banks seen in lower Flat Creek downcreek from Constable Road

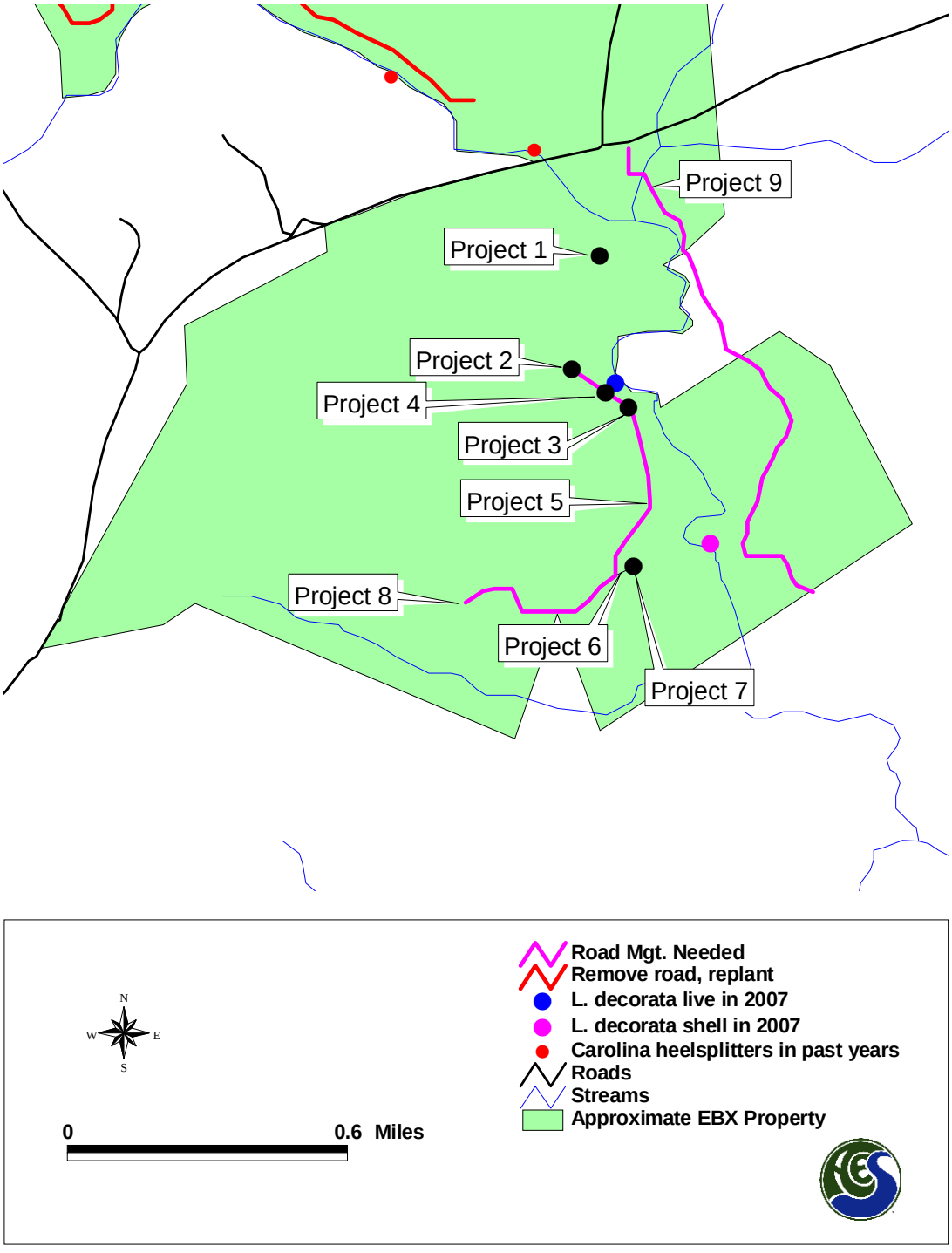

Figure 9. Areas within the lower proposed EBX property needing management actions

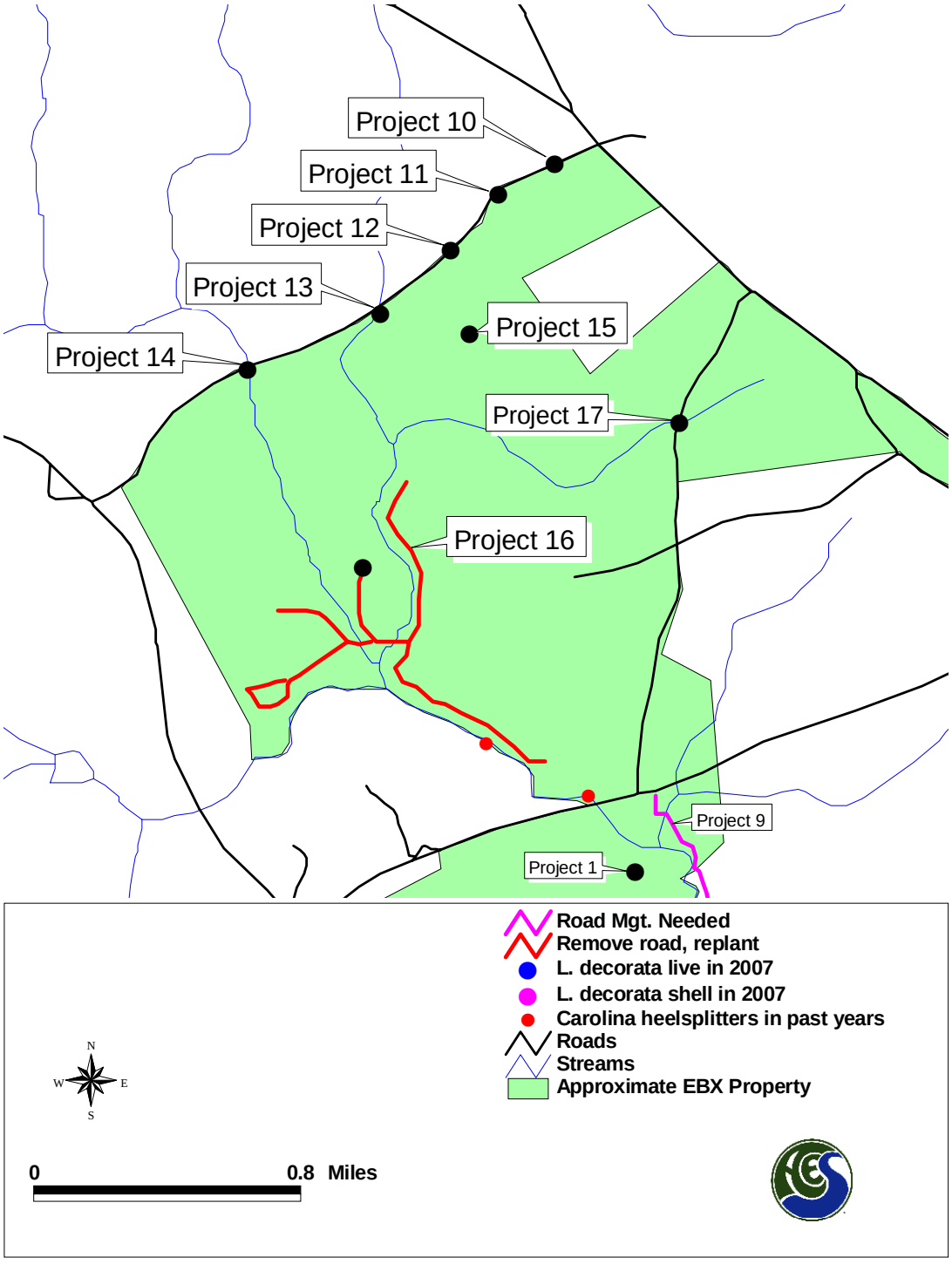

Figure 10. Areas within the upper proposed EBX property needing management actions

APPENDIX – Survey station results from the Flat Creek Subbasin

PROJECT: EBX Carolina heelsplitter survey

TARGET SPECIES: Federally listed endangered Carolina heelsplitter (*Lasmigona decorata*)

BIOLOGISTS: **John Alderman**
Jeffrey West

SCDNR Endangered Mussel Survey Permit Authorization: November 25, 2002

U.S. FISH AND WILDLIFE SERVICE ES PERMIT: **TE065756-0**

STATION 20070313.1jma

LOCATION: Flat Cr., upcreek from Overbrook Rd. (34.67767 N, 80.54167 W) up to Big Double Br. (34.68270 N, 80.55070 W), Lancaster County, South Carolina

SURVEY DATE: March 13, 2007

SITE COMMENTS: Heavy sediment load; much bedload transport

HABITAT:

WATERBODY TYPE:	Stream
FLOW:	Run, riffle, slack, pool
RELATIVE DEPTH:	Very shallow to shallow
DEPTH (%<2 FEET):	75
SUBSTRATE:	Clay, **silt, sand,** gravel, cobble, boulder, bedrock
COMPACTNESS:	Normal and unconsolidated
SAND/GRAVEL BARS:	Common
WOODY DEBRIS:	Low
BEAVER ACTIVITY:	Evidence (gnawed sticks)
WINDTHROW:	Low
TEMPORARY POOLS:	Present
CHANNEL WIDTH:	11+ meters
BANK HEIGHT:	2.5+ meters
BANK STABILITY:	Unstable with some erosion/undercutting and some areas stable
BUFFER WIDTH:	Narrow to Wide
RIPARIAN VEGETATION:	Wooded, shrub-brush
LAND USE:	Natural, timber, rural

PERCENT COVER:	40+
WOODLAND EXTENT:	Extensive
NATURAL LEVEES:	At least one
VISIBILITY:	Slightly turbid
WATER LEVEL:	Normal

HABITAT (CONTINUED):

WEATHER:	Sunny, warm

TECHNIQUES AND SURVEY TIME:

TECHNIQUES:	Visual; tactile
SURVEY TIME:	4.0 person-hours

FRESHWATER MUSSELS:

Villosa delumbis – 1 live male (35 mm); 5 shells

OTHER TAXA:

Corbicula fluminea - Uncommon

PROJECT: EBX Carolina heelsplitter survey

STATION: 20070313.2jma

BIOLOGISTS: **John M. Alderman**
Jeffrey West

U.S. FISH AND WILDLIFE SERVICE ES PERMIT: **TE065756-0**

S.C. DEPARTMENT OF NATURAL RESOURCES AUTHORIZATION: November 25, 2002

LOCATION: Flat Cr. from Big Double Branch up to Duckwood Road (34.67768 N, 80.55886 W), Lancaster County, South Carolina

SURVEY DATE: March 13, 2007

SITE COMMENTS: Slumping and scoured banks common; significant bedload transport but with some areas of stable substrate

HABITAT:

WATERBODY TYPE:	Stream
FLOW:	Run, riffle, slack, pool
RELATIVE DEPTH:	Very shallow to shallow
DEPTH (%<2 FEET):	80
SUBSTRATE:	Clay, **silt, sand**, gravel, cobble, boulder
COMPACTNESS:	Normal to unconsolidated
SAND/GRAVEL BARS:	Common
WOODY DEBRIS:	Low
BEAVER ACTIVITY:	Evidence (gnawed sticks)
WINDTHROW:	Low
TEMPORARY POOLS:	Present
CHANNEL WIDTH:	7.5+ m
BANK HEIGHT:	2.5+ m

HABITAT (cont.):

BANK STABILITY:	Unstable (slumping and scoured banks common) with some areas with erosion/undercutting and limited areas with banks considered very stable
BUFFER WIDTH:	Wide
RIPARIAN VEGETATION:	Wooded, shrub-brush – some areas with recently Clearcut/poor quality buffers
LAND USE:	Natural, timber, rural
PERCENT COVER:	10
WOODLAND EXTENT:	Extensive
NATURAL LEVEES:	At least one
VISIBILITY:	Slightly turbid
WATER LEVEL:	Normal
WEATHER:	Sunny, warm

TECHNIQUES AND SURVEY TIME:

TECHNIQUES:	Visual/tactile
SURVEY TIME:	4.0 person hours

FRESHWATER MUSSELS:

Strophitus undulatus – 1 old valve
Villosa delumbis – 2 shells

OTHER DOCUMENTED TAXA:

Corbicula fluminea

PROJECT: EBX Carolina heelsplitter survey

STATION: 20070314.1jma

BIOLOGISTS: **John M. Alderman**
Jeffrey West

U.S. FISH AND WILDLIFE SERVICE ES PERMIT: **TE065756-0**

S.C. DEPARTMENT OF NATURAL RESOURCES AUTHORIZATION: November 25, 2002

LOCATION: Flat Cr. from downcreek property line (34.66280 N, 80.53555 W) up to sandbar (34.66585 N, 80.53654 W), Lancaster County, South Carolina

SURVEY DATE: March 14, 2007

SITE COMMENTS: Banks slumping in places; very heavy sediment load

HABITAT:

WATERBODY TYPE:	Stream
FLOW:	Run, slack, pool
RELATIVE DEPTH:	Shallow
DEPTH (%<2 FEET):	50
SUBSTRATE:	Clay, silt, sand, gravel
COMPACTNESS:	Normal to **unconsolidated**
SAND/GRAVEL BARS:	Present
WOODY DEBRIS:	Average to high (in places)
BEAVER ACTIVITY:	Evidence (gnawed sticks)
WINDTHROW:	Low
TEMPORARY POOLS:	Present
CHANNEL WIDTH:	11+ m
BANK HEIGHT:	2.25+ m

HABITAT (cont.):

BANK STABILITY:	Unstable with some erosion/undercutting
BUFFER WIDTH:	Wide
RIPARIAN VEGETATION:	Wooded, shrub-brush
LAND USE:	Natural, timber, rural
PERCENT COVER:	65
WOODLAND EXTENT:	Extensive
NATURAL LEVEES:	At least one
VISIBILITY:	Slightly turbid
WATER LEVEL:	Normal
WEATHER:	Sun-Cloud, warm

TECHNIQUES AND SURVEY TIME:

TECHNIQUES:	Visual, tactile
SURVEY TIME:	1.5 person-hours

FRESHWATER MUSSELS:

Lasmigona decorata – 1 shell (88 mm)
Villosa delumbis – 1 male shell

OTHER DOCUMENTED TAXA:

Corbicula fluminea

PROJECT: EBX Carolina heelsplitter survey

STATION: 20070314.2jma

BIOLOGISTS: **John M. Alderman**
Jeffrey West

U.S. FISH AND WILDLIFE SERVICE ES PERMIT: **TE065756-0**

S.C. DEPARTMENT OF NATURAL RESOURCES AUTHORIZATION: November 25, 2002

LOCATION: Flat Cr. from sandbar (34.66585 N, 80.53654 W) up to location of live *L. decorata* (34.67082 N, 80.53949 W), Lancaster County, South Carolina

SURVEY DATE: March 14, 2007

SITE COMMENTS: Much bank slumping

HABITAT:

WATERBODY TYPE:	Stream
FLOW:	Run, slack, pool
RELATIVE DEPTH:	Shallow
DEPTH (%<2 FEET):	60
SUBSTRATE:	**Clay**, silt, **sand, gravel**
COMPACTNESS:	Normal and **unconsolidated**
SAND/GRAVEL BARS:	Common
WOODY DEBRIS:	Average
BEAVER ACTIVITY:	Evidence (gnawed sticks)
WINDTHROW:	Moderate
TEMPORARY POOLS:	Present
CHANNEL WIDTH:	11+ m
BANK HEIGHT:	2+ m

HABITAT (cont.):

BANK STABILITY:	Unstable with some erosion/undercutting
BUFFER WIDTH:	Wide
RIPARIAN VEGETATION:	Wooded, shrub-brush
LAND USE:	Natural, timber, rural
PERCENT COVER:	60
WOODLAND EXTENT:	Extensive
NATURAL LEVEES:	At least one
VISIBILITY:	Slightly turbid
WATER LEVEL:	Normal
WEATHER:	Sun-Cloud, warm

TECHNIQUES AND SURVEY TIME:

TECHNIQUES:	Visual/tactile
SURVEY TIME:	4.33 person hours

FRESHWATER MUSSELS:

Lasmigona decorata – 1 live: 47 mm (M342, M343)
Strophitus undulatus –2 shells

OTHER DOCUMENTED TAXA:

Corbicula fluminea

PROJECT: EBX Carolina heelsplitter survey

STATION: 20070314.3jma

BIOLOGISTS: **John M. Alderman**
Jeffrey West

U.S. FISH AND WILDLIFE SERVICE ES PERMIT: **TE065756-0**

S.C. DEPARTMENT OF NATURAL RESOURCES AUTHORIZATION: November 25, 2002

LOCATION: Flat Cr. from sandbar (34.67082 N, 80.53949 W) up to sandbar (34.67223 N, 80.53970 W), Lancaster County, South Carolina

SURVEY DATE: March 14, 2007

SITE COMMENTS: Bank slumping common

HABITAT:

WATERBODY TYPE:	Stream
FLOW:	Run, riffle, slack, pool
RELATIVE DEPTH:	Shallow
DEPTH (%<2 FEET):	70
SUBSTRATE:	**Clay**, silt, **sand, gravel**
COMPACTNESS:	Normal and **unconsolidated**
SAND/GRAVEL BARS:	Common
WOODY DEBRIS:	Average to high
BEAVER ACTIVITY:	Evidence (gnawed sticks)
WINDTHROW:	Moderate
TEMPORARY POOLS:	Present
CHANNEL WIDTH:	11+ m
BANK HEIGHT:	2+ m

HABITAT (cont.):

BANK STABILITY:	Unstable with some erosion/undercutting
BUFFER WIDTH:	Wide
RIPARIAN VEGETATION:	Wooded, shrub-brush
LAND USE:	Natural, timber, rural
PERCENT COVER:	50
WOODLAND EXTENT:	Extensive
NATURAL LEVEES:	At least one
VISIBILITY:	Slightly turbid
WATER LEVEL:	Normal
WEATHER:	Sun-Cloud, warm

TECHNIQUES AND SURVEY TIME:

TECHNIQUES:	Visual/tactile
SURVEY TIME:	0.5 person hours

FRESHWATER MUSSELS:

None

OTHER TAXA:

Corbicula fluminea

PROJECT: EBX Carolina heelsplitter survey

STATION: 20070315.1jma

BIOLOGISTS: **John M. Alderman**
Jeffrey West

U.S. FISH AND WILDLIFE SERVICE ES PERMIT: **TE065756-0**

S.C. DEPARTMENT OF NATURAL RESOURCES AUTHORIZATION: November 25, 2002

LOCATION: Flat Cr. from sandbar (34.67223 N, 80.53970 W) up to Overbrook Rd. (34.67761 N, 80.54138 W), Lancaster County, South Carolina

SURVEY DATE: March 15, 2007

SITE COMMENTS: Much bank slumping and scour

HABITAT:

WATERBODY TYPE:	Stream
FLOW:	Run, slack, pool
RELATIVE DEPTH:	Shallow
DEPTH (%<2 FEET):	65
SUBSTRATE:	**Clay**, silt, **sand**, **gravel,** cobble, boulder
COMPACTNESS:	Normal and unconsolidated
SAND/GRAVEL BARS:	Common
WOODY DEBRIS:	Average to high
BEAVER ACTIVITY:	Evidence (gnawed sticks)
WINDTHROW:	Low
TEMPORARY POOLS:	Present
CHANNEL WIDTH:	11+ meters
BANK HEIGHT:	2.5+ meters

HABITAT (cont.):

BANK STABILITY:	Unstable with some erosion/undercutting
BUFFER WIDTH:	Wide
RIPARIAN VEGETATION:	Wooded, shrub-brush
LAND USE:	Natural, timber, rural
PERCENT COVER:	50
WOODLAND EXTENT:	Extensive
NATURAL LEVEES:	At least one
VISIBILITY:	Slightly turbid
WATER LEVEL:	Normal
WEATHER:	Sun-Cloud, warm

TECHNIQUES AND SURVEY TIME:

TECHNIQUES:	Visual, tactile
SURVEY TIME:	4.0 person-hours

FRESHWATER MUSSELS:

Strophitus undulatus – 1 shell
Villosa delumbis – 1 live male, 1 gravid female, 3 shells

OTHER DOCUMENTED TAXA:

Corbicula fluminea

PROJECT: EBX Carolina heelsplitter survey

STATION: 20070321.1jma

BIOLOGISTS: **John M. Alderman**
Jeffrey West

U.S. FISH AND WILDLIFE SERVICE ES PERMIT: **TE065756-0**

S.C. DEPARTMENT OF NATURAL RESOURCES AUTHORIZATION: November 25, 2002

LOCATION: Flat Cr. downcreek from Constable Rd. near 34.63368 N, 80.46285 W; Lancaster County, South Carolina

SURVEY DATE: March 21, 2007

SITE COMMENTS: *L. decorata* mostly found along right shore

HABITAT:

WATERBODY TYPE:	Stream
FLOW:	Run, riffle, slack, pool
RELATIVE DEPTH:	Shallow
DEPTH (%<2 FEET):	70
SUBSTRATE:	Clay, silt, sand, gravel, cobble, boulder, bedrock
COMPACTNESS:	Normal and unconsolidated
SAND/GRAVEL BARS:	Rare
WOODY DEBRIS:	Average
BEAVER ACTIVITY:	Evidence (gnawed sticks)
WINDTHROW:	Low
TEMPORARY POOLS:	None
CHANNEL WIDTH:	8.6+ meters
BANK HEIGHT:	1.5+ meters

HABITAT (cont.):

BANK STABILITY:	Very stable
BUFFER WIDTH:	Wide
RIPARIAN VEGETATION:	Wooded, shrub-brush
LAND USE:	Natural, timber, rural
PERCENT COVER:	80
WOODLAND EXTENT:	Extensive
NATURAL LEVEES:	At least one
VISIBILITY:	Slightly turbid
WATER LEVEL:	Normal
WEATHER:	Sun-Cloud, cool

TECHNIQUES AND SURVEY TIME:

TECHNIQUES:	Visual, tactile
SURVEY TIME:	2.0 person-hours

FRESHWATER MUSSELS:

Lasmigona decorata – 5 live: 86 mm (M344, M345), 68 mm (M346, M347), 54 mm (M348, M349), 82 mm (M350, M351), 61 mm (M352, M353)
Elliptio complanata – 23 live
Elliptio angustata – 1 live
Elliptio producta – 1 live
Villosa delumbis – 1 live male

OTHER DOCUMENTED TAXA:

Corbicula fluminea

PROJECT: EBX Carolina heelsplitter survey

STATION: 20070321.2jma

BIOLOGISTS: **John M. Alderman**
Jeffrey West

U.S. FISH AND WILDLIFE SERVICE ES PERMIT: **TE065756-0**

S.C. DEPARTMENT OF NATURAL RESOURCES AUTHORIZATION: November 25, 2002

LOCATION: Flat Cr. downcreek from Constable Rd. (34.63229 N, 80.45631 W), Lancaster County, South Carolina

SURVEY DATE: March 21, 2007

SITE COMMENTS: Within 50 meters upcreek and downcreek from the above latitude/longitude; most *Lasmigona decorata* found along right descending shoreline in clay bank

HABITAT:

WATERBODY TYPE:	Stream
FLOW:	Run, slack, pool
RELATIVE DEPTH:	Shallow
DEPTH (%<2 FEET):	50
SUBSTRATE:	Clay, silt, sand
COMPACTNESS:	Normal and unconsolidated
SAND/GRAVEL BARS:	Present
WOODY DEBRIS:	Average
BEAVER ACTIVITY:	Evidence (gnawed sticks)
WINDTHROW:	Low
TEMPORARY POOLS:	Present
CHANNEL WIDTH:	9+ meters
BANK HEIGHT:	1.5+ meters

HABITAT (cont.):

BANK STABILITY:	Very stable
BUFFER WIDTH:	Wide
RIPARIAN VEGETATION:	Wooded, shrub-brush
LAND USE:	Natural, timber, rural
PERCENT COVER:	70
WOODLAND EXTENT:	Extensive
NATURAL LEVEES:	At least one
VISIBILITY:	Slightly turbid
WATER LEVEL:	Normal
WEATHER:	Sun-Cloud, warm

TECHNIQUES AND SURVEY TIME:

TECHNIQUES:	Visual, tactile
SURVEY TIME:	1.0 person-hour

FRESHWATER MUSSELS:

Lasmigona decorata – 9 live: 78 mm (M354, M355), 74 mm (M356, M371), 68 mm (M358, M357), 76 mm (M360, M359), 58 mm (M362, M361), 63 mm (M364, M363), 60 mm (M366, M365), 71 mm (M368, M367), 62 mm (M370, M369)
Elliptio complanata – 16 live
Elliptio angustata – 1 live
Villosa delumbis – 2 live males

OTHER DOCUMENTED TAXA:

Corbicula fluminea

PROJECT: EBX Carolina heelsplitter survey

STATION: 20070322.1jma

BIOLOGISTS: **John M. Alderman**

U.S. FISH AND WILDLIFE SERVICE ES PERMIT: **TE065756-0**

S.C. DEPARTMENT OF NATURAL RESOURCES AUTHORIZATION: November 25, 2002

LOCATION: Big Double Branch from near confluence with Little Double Branch upcreek ~300 meters, Lancaster County, South Carolina

SURVEY DATE: March 22, 2007

SITE COMMENTS: High quality stream with stable banks (mostly)

HABITAT:

WATERBODY TYPE:	Stream
FLOW:	Run, riffle, slack, pool
RELATIVE DEPTH:	Very shallow
DEPTH (%<2 FEET):	90
SUBSTRATE:	Silt, sand, gravel, cobble, boulder, bedrock
COMPACTNESS:	Normal
SAND/GRAVEL BARS:	Present
WOODY DEBRIS:	Low
BEAVER ACTIVITY:	Evidence (gnawed sticks)
WINDTHROW:	None
TEMPORARY POOLS:	None
CHANNEL WIDTH:	up to 5+ meters
BANK HEIGHT:	1+ meters

HABITAT (cont.):

BANK STABILITY:	Very stable
BUFFER WIDTH:	Wide
RIPARIAN VEGETATION:	Wooded, shrub-brush
LAND USE:	Natural, timber, rural
PERCENT COVER:	90
WOODLAND EXTENT:	Extensive
NATURAL LEVEES:	At least 1 large
VISIBILITY:	Clear
WATER LEVEL:	Normal
WEATHER:	Sun-Cloud, warm

TECHNIQUES AND SURVEY TIME:

TECHNIQUES:	Visual, tactile
SURVEY TIME:	0.7 person-hours

FRESHWATER MUSSELS:

Villosa delumbis – 1 male shell, 1 fragment

OTHER DOCUMENTED TAXA:

Corbicula fluminea

PROJECT: EBX Carolina heelsplitter survey

STATION: 20070322.2jcw

BIOLOGIST: **Jeffrey West**

U.S. FISH AND WILDLIFE SERVICE ES PERMIT: **TE065756-0**

S.C. DEPARTMENT OF NATURAL RESOURCES AUTHORIZATION: November 25, 2002

LOCATION: Little Double Br. from near confluence with Big Double Branch upcreek ~300 meters, Lancaster County, South Carolina

SURVEY DATE: March 22, 2007

SITE COMMENTS: Much algae

HABITAT:

WATERBODY TYPE:	Stream
FLOW:	Run, riffle, slack, pool
RELATIVE DEPTH:	Very shallow
DEPTH (%<2 FEET):	100
SUBSTRATE:	Silt, sand, gravel, cobble, boulder, bedrock
COMPACTNESS:	Normal
SAND/GRAVEL BARS:	Common
WOODY DEBRIS:	Low
BEAVER ACTIVITY:	None
WINDTHROW:	None
TEMPORARY POOLS:	None
CHANNEL WIDTH:	up to 5+ meters
BANK HEIGHT:	1+ meters

HABITAT (cont.):

BANK STABILITY:	Very stable with some erosion/undercutting
BUFFER WIDTH:	Wide
RIPARIAN VEGETATION:	Wooded, shrub-brush
LAND USE:	Natural, timber, rural
PERCENT COVER:	100
WOODLAND EXTENT:	Extensive
NATURAL LEVEES:	-
VISIBILITY:	Clear
WATER LEVEL:	Low
WEATHER:	Sun-Cloud, warm

TECHNIQUES AND SURVEY TIME:

TECHNIQUES:	Visual/tactile
SURVEY TIME:	0.3 person hours

FRESHWATER MUSSELS:

None

APPENDIX E

Distribution and Status

Of the

Sandhills Chub and Pinewood Darter

The Journal of the Elisha Mitchell Scientific Society, 107(2), 1991, pp. 61–70

DISTRIBUTION AND STATUS OF THE SANDHILLS CHUB, *Semotilus lumbee*, AND THE PINEWOODS DARTER, *Etheostoma mariae*

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RUDOLF G. ARNDT

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Stockton State College,
Pomona, NJ 08240

Abstract: Fishes of seven North Carolina and South Carolina river systems were sampled to determine the distribution and current status of two fishes, the sandhills chub *Semotilus lumbee* and the pinewoods darter *Etheostoma mariae* both endemic to the Carolina Sandhills area. A total of 261 localities in 15 counties was sampled. The chub was found at 53 of these localities, and the darter at 37. The chub could not be located at 11 (42%), and the darter at 9 (31%), of previously known localities. In many cases this was due to habitat deterioration caused by man and the recent and highly successful reintroduction of the beaver. We found the chub at 38 and the darter at 17 previously undocumented localities. We took the chub in the Wateree River system, South Carolina, in which it was previously not known. Both species at present are doing well, but, because of their limited distributions, their status should be monitored.

Key Words: *Semotilus lumbee*; *Etheostoma mariae*; sandhills chub; pinewoods darter; Carolina Sandhills.

INTRODUCTION

The Carolina Sandhills is the northeastern terminus of a row of distinctive hills, the Fall Line Hills, which extend in a discontinuous row from central North Carolina through central Alabama to eastern Mississippi, and with their outer margin located on the Fall Line (Duke, 1961). The Carolina Sandhills land type is best developed in south-central North Carolina (Hoke, Moore, Richmond and Scotland counties) and in adjacent South Carolina (Chesterfield County). Here the hills roll gently, with elevations of from 60 to 150 m above sea level (Bartlett, 1967). Further south and southwest in South Carolina this land type becomes progressively less distinctive (Snelson and Suttkus, 1978). The substrate is of loose sand, and typical vegetation is longleaf pine; pin oak, turkey oak, and scrub oak associations; and wire grass (Duke, 1961). The area is drained by numerous small, fast-flowing and cold streams, and headwater tributaries are in a youthful stage of development with well-marked, though flat, drainage divides (Snelson and Suttkus, 1978). The pronouncedly xeric conditions have resulted in the presence of a number of rare plants and animals (Cooper et al., 1977).

Two fishes, the sandhills chub *Semotilus lumbee* and the pinewoods darter *Etheostoma mariae* are endemic to the Carolina Sandhills and adjacent areas. The chub was described by Snelson and Suttkus as recently as 1978; the darter was described by Fowler in 1947. Little additional information has been published on these localized fishes. Richards (1963) reviewed systematics of the darter, and Rohde and Ross (1987) reported on its life history based primarily on data from one creek. Menhinick (1987) stated that both the darter and the chub appear to be restricted to headwater streams, some of which may be very small, and that these habitats are easily impacted by man. Rohde and Ross (1987) sampled some of the known sites of the darter. Recent work on the chub has focused on spawning behavior (Woolcott and Maurakis, 1988). Olmsted and Cloutman (1979) reported on the fishes of the Carolina Sandhills National Wildlife Refuge in Chesterfield County, South Carolina. No study of the fish fauna of the entire Carolina Sandhills area has been made.

The Carolina Sandhills are increasingly being stressed by man in this agricultural, residential, and tourist area. Growth of the towns of Aberdeen, Pinehurst, Pine Bluff, and Southern Pines has altered the local landscape. Damming of headwaters to create ponds for golf courses and for their irrigation has changed habitats and altered water flow regimes. Agriculture, lumbering, and road management practices sometimes result in stream siltation, and the use of pesticides may cause water pollution. Successful reintroduction of the beaver *Castor canadensis* (Taylor, 1985) has converted much lotic to lentic habitat.

Because this chub and this darter are known only from the Carolina Sandhills area, their status is of concern to state and federal management agencies. Both were listed as species of "Special Concern" in a 1975 North Carolina symposium on threatened and endangered species (Cooper et al., 1977), by Menhinick (1987), and in a current North Carolina state species update (A. Braswell, North Carolina State Museum of Natural Sciences, pers. comm., 1989). In South Carolina, the state's Heritage Trust Program considers the chub to be threatened and the darter on the edge of extirpation (K. Boyle, South Carolina Heritage Trust Program, pers. comm., 1990). The American Fisheries Society lists both as species of "Special Concern" (Williams et al., 1989). Both were listed for possible addition to the Federal Threatened Species List in the U.S. Federal Register Vol. 50, No. 181, 18 September 1985.

In this study we summarize all available data on the distribution and status of *Semotilus lumbee* and *Etheostoma mariae* and augment it with our recent field data. Summarized data on habitat and fish species associations are also presented.

MATERIALS AND METHODS

Distribution and abundance data were obtained from: 1) literature; 2) specimens at the North Carolina State Museum of Natural Sciences and the United States National Museum; 3) collections of Rohde and Ross (1987); 4) unpublished records of D. Cloutman, E. Menhinick and V. Schneider (all pers. comm., 1988); and 5) our field collections and observations.

We made collections with a 3.0 m × 1.2 m, 3.2 mm mesh nylon flat seine from August 1988 through March 1991 at irregular intervals throughout the study period. North Carolina Division of Environmental Management (DEM) personnel also made collections with a backpack electrofisher in the fall of 1988 and in the

summer of 1990; four of these sites were also sampled by us with a seine. All habitats at each site were sampled although habitats known to be preferred by the chub and the darter were emphasized. Fishes in most collections were identified in the field, counted and released, while collections containing the chub and the darter were preserved for later processing. These latter collections were subsequently deposited at the North Carolina State Museum of Natural Sciences. Data on habitat (air and water temperatures, pH, stream depth, width and current velocity, substrate and aquatic vegetation) and fish species associations were also recorded.

Additional sites were selected but due to the presence of unsuitable environmental conditions such as no water, no water flow and/or the presence of highly eutrophic conditions, these sites were not, or did not appear, capable of supporting either species. Consequently, no collecting was possible or attempted, but the site was noted as being visually surveyed and was map-plotted.

Emphasis in this study initially (1988 and early 1989) was on sampling at all the previously documented localities in order to determine the current status of the two fishes. In most of 1989, 1990, and 1991, sampling was intensified in that area outside the periphery of the previously known distributions, with the goal of determining the total range of these species.

Sandhills boundaries were plotted from county general soil maps published by the U.S. Department of Agriculture, Soil Conservation Service.

RESULTS

Study Area

Streams located in the upper Lumber River and in the upper Little Pee Dee River drainages and, to a lesser degree, on adjacent streams of the Broad, Cape Fear, Congaree, Pee Dee, and Wateree rivers were sampled. This area includes most of Moore, Richmond, and Scotland counties, North Carolina, and Chesterfield and Marlboro counties, South Carolina, as well as portions of Cumberland, Harnett, Hoke, Lee, and Montgomery counties, North Carolina, and Calhoun, Kershaw, Lancaster, Richland, and Sumter counties, South Carolina. A total of 203 seine collections was made at 200 sites. In addition, DEM personnel made 6 collections at 6 sites (4 of which we sampled). We visually surveyed an additional 59 sites (Fig. 1). Localities sampled in Calhoun, southwestern Kershaw, Richland, and Sumter counties (21 actual, 1 visual) are not figured. Detailed locality data are available from the senior author.

Semotilus lumbee

Status.—This chub was previously known from 26 localities, primarily from the upper Lumber River, but also from the Cape Fear and Pee Dee river drainages, in both the Carolinas. It is currently known from 15 of these localities. In addition, we record it from 38 new localities, for a total of 53 currently-known sites (Fig. 2, Table 1).

Some of the new records significantly extend its range: the first records from the Little Pee Dee River drainage, as well as additional records from lower Drowning Creek, extend its distribution to the southeast; the first three sites in the Deep River system extend it to the north; and one new site in the Lynches River system

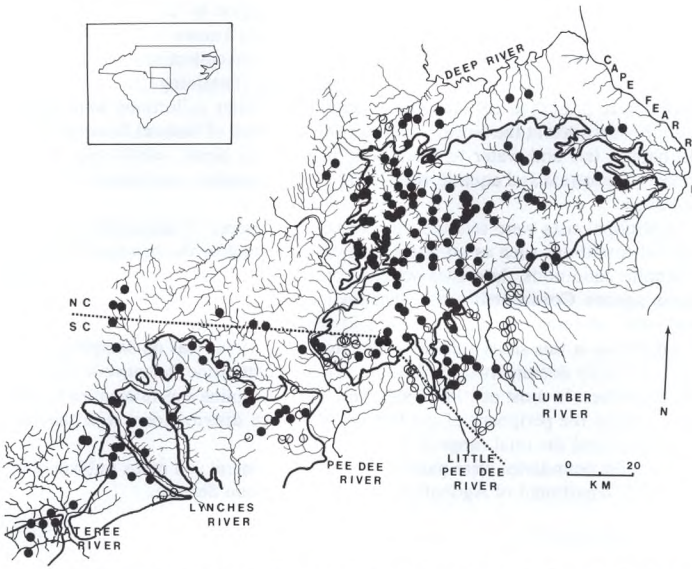

FIG. 1. Sites sampled by seine (solid dots) and visually (open circles) for *Semotilus lumbee* and *Etheostoma mariae* in North Carolina and South Carolina, August 1988 through March 1991. Dark solid lines encompass the Sandhills. Indicators of a few localities overlap.

extends it to the west (Fig. 2). On 23 September 1990, we took this chub at two localities in a tributary to the east-central portion of the Wateree river in Kershaw County, South Carolina, on our first effort to find this fish in this system. On 18 January 1991, we took this chub nearby but on the western side of the Wateree. Limited sampling by us nearby in the Broad and Congaree rivers in January and March 1991 has not revealed this fish in these drainages.

The range of the highly similar but much more widely distributed creek chub *Semotilus atromaculatus* is allopatric with that of the sandhills chub, and it essentially surrounds that of the latter (Lee and Platania, 1980). Snelson and Suttkus (1978) report only one locality, located on the edge of the range of *S. lumbee,* where these two chubs occurred sympatrically, and we found two additional, and also peripheral, localities of sympatry. At 16 other sites on the periphery of the range of the sandhills chub in those river systems from which it was previously known and in which we concentrated our sampling, i.e., the Pee Dee, Cape Fear, and Wateree rivers, we took only the closely-related creek chub which in these rivers apparently replaced the sandhills chub. Thus, we believe we have delineated the limits of the range of the sandhills chub in the Pee Dee and Cape Fear river systems.

Habitat.—The sandhills chub prefers clear, cool, medium-current streams, a sand/gravel substrate and no or little vegetation. It is most abundant in narrow

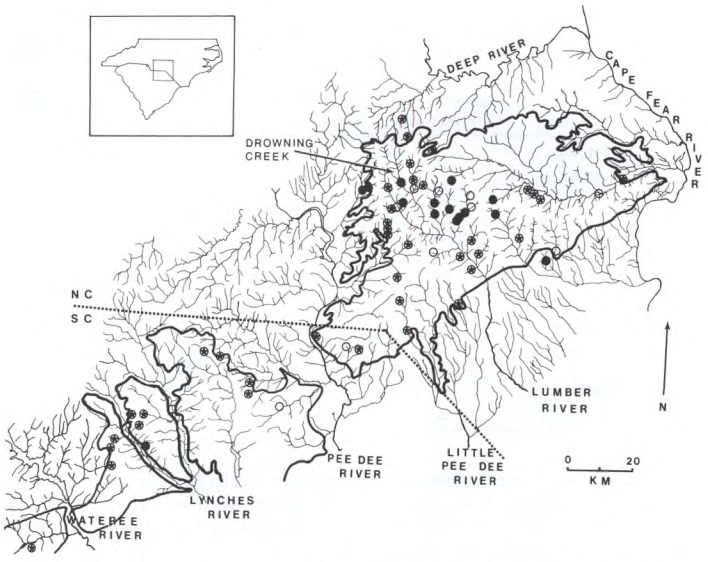

FIG. 2. Previously-known (solid dots), newly-discovered (stars) and extirpated (open circles) localities for *Semotilus lumbee* in North Carolina and South Carolina through March 1991.

(1.2 m to 2.4 m wide) and shallow (0.15 m to 0.38 m deep) first order headwater streams where it is the dominant, and sometimes the only, fish present. Numbers taken per collection ranged from 0 to 80. For all captures, stream width was 0.9 m to 6.1 m (mean 2.8 m), water depth was 0.15 m to 1.2 m (mean 0.57 m), substrate was sand or sand/gravel and current velocity ranged from 0.02 m/sec to 0.67 m/sec (mean 0.22 m/sec). The water was clear, usually only slightly brown-stained, and pH ranged from 5.0 to 7.2 (mean 6.2). Submerged vegetation was absent at 32 of the 53 sites, and, when plants were present, the chub was usually present in deeper waters that lacked them. Thirty-nine fish species were collected with *S. lumbee.* The most common (taken in 40% or more of the *lumbee* collections) were pirate perch *Aphredoderus sayanus* (taken in 67% of collections), and dusky shiner *Notropis cummingsae* (50%).

Etheostoma mariae

Status.—This darter has previously been recorded from 29 localities, all in the upper Lumber and Little Pee Dee river drainages. Additionally, Menhinick (1987) reported on two unverified localities from the Pee Dee River drainage. However, we did not collect it at either of these two sites, and we presume these extralimital records to be based on misidentifications. *Etheostoma mariae* is currently known from 20 of these 29 localities (Fig. 3, Table 2). We recorded it from 17 new sites: 11 in tributary streams of Drowning Creek; five in the upper Little Pee Dee River

Table 1

Semotilus lumbee localities previously-known, extirpated and recently discovered, by state and county.

State and County	Number Previous Known Localities	Number Extirpated Localities	Number Localities Present Survey	Number New Localities
North Carolina				
Cumberland	1	1	0	0
Harnett	0	0	1	1
Hoke	3	1	8	6
Montgomery	1	0	1	0
Moore	13	4	15	6
Richmond	4	2	10	8
Scotland	0	0	4	4
South Carolina				
Chesterfield	1	1	2	2
Kershaw	2	1	4	3
Marlboro	1	1	2	2
Totals	26	11	47	32

drainage; and one in the Lumber River. Only one specimen was collected at this last site, the southern-most known in this system. Most of the new localities represent populations in additional streams and not merely additional records from streams with known populations (Fig. 3).

Habitat.—The pinewoods darter prefers small, cool, fast-flowing first and second order streams with abundant submerged aquatic vegetation. Numbers taken per collection ranged from 0 to 49. Stream width was 1.2 m to 9.1 m (mean 4.1 m), but usually was 2.1 m to 3.6 m wide. Capture depth was 0.25 m to 1.2 m, but usually was less than 0.76 m. Substrate typically was sand or sand/gravel. Current was swift and ranged from 0.07 m/sec to 0.67 m/sec (mean 0.31 m/sec). Only a few specimens were found in streams with lower velocities. Water pH ranged from 5.8 to 7.2 (mean 6.3). The water was clear and was usually stained slightly brown by tannins.

Rooted aquatic vegetation was present at 30 of the 37 known sites. It consisted of spadderdock *Nuphar luteum,* pondweed *Potamogeton diversifolius,* golden club *Orontium aquaticum,* bur reed *Sparganium americanum,* rushes *Juncus* sp., and arrowhead or related *Sagittaria* sp. The darter was most abundant in dense rooted vegetation, and few specimens were taken at sites that lacked it. Thirty-seven fish species were collected with *E. mariae.* The most common (taken in 40% or more of the collections) were *Notropis cummingsae* (taken in 74% of the collections), *Noturus insignis* (60%), *Aphredoderus sayanus* (54%), tessellated darter *Etheostoma olmstedi* (51%), and *Semotilus lumbee* (43%). The pinewoods darter and the sandhills chub were sympatric at 16 localities.

DISCUSSION

Semotilus lumbee

Because this chub is larger, a stronger swimmer and is less restricted to a specific habitat than is the darter, it is more difficult to collect, and thus its numbers are

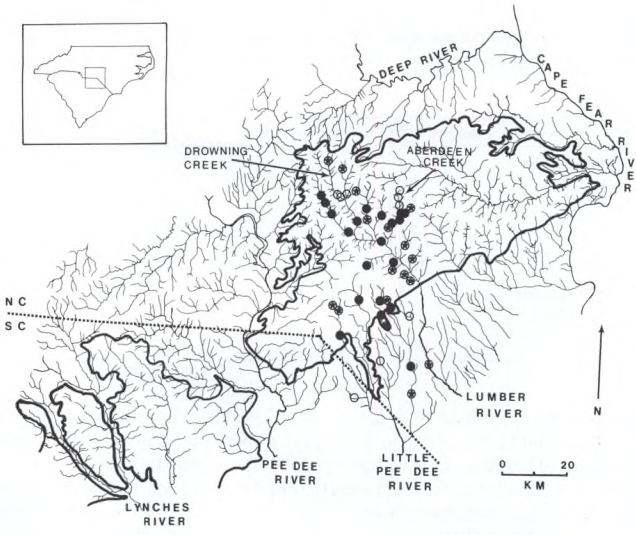

FIG. 3. Previously-known (solid dots), newly-discovered (stars) and extirpated (open circles) localities for *Etheostoma mariae* in North Carolina and South Carolina through March 1991.

more likely to be underestimated than are those of the darter. We assume that this chub has been extirpated from at least seven of the 11 sites from which it was previously known as a result of significant habitat degradation resulting from stream impoundment. Its absence at the other four sites could be real or due to sampling error.

Although effort was not standard, the numbers of chub we collected at resampled sites are similar to or higher than those taken in earlier years. Populations at the 53 known localities are apparently healthy, and habitat quality appears excellent. None of these populations appear to be in jeopardy.

Etheostoma mariae

The darter is now absent from nine of the previously recorded sites, seven of which are due to habitat degradation. Several sites, including the type locality at the outlet of Watson's Lake (Fowler, 1947), have been impounded, and other sites suffer from severe eutrophication, including the only reported collection in South Carolina, in which state this darter is now extirpated. The absence of recent specimens from upper Drowning Creek (two sites) is enigmatic as the stream appears in good condition and numerous other fish associates were collected. Drowning Creek, however, has apparently never supported a large population of *E. mariae* as most records are of but a few fish. The creek is apparently larger than that preferred by this darter and necessary vegetation is rare.

Again, although effort was not standard, numbers of the darter collected at

Table 2

Etheostoma mariae localities previously known, extirpated and recently discovered, by state and county.

State and County	Number Previous Known Localities	Number Extirpated Localities	Number Localities Present Survey	Number New Localities
North Carolina				
Hoke	0	0	2	2
Moore	14	6	14	6
Richmond	4	0	6	2
Robeson	0	0	2	2
Scotland	10	2	13	5
South Carolina				
Marlboro	1	1	0	0
Totals	29	9	37	17

resampled sites are similar to or higher than those taken in prior collections. The 37 known populations appear to be healthy as based on numbers taken and on high quality of habitat. None of these populations appear to be in jeopardy.

We noted a close association between the numbers of the darter and the presence of highway bridges: the cleared highway rights-of-way and their associated bridges increase available sunlight and this facilitates growth of aquatic vegetation; in similar tree-shaded streams we noted less vegetation and fewer specimens of the darter.

RECOMMENDATIONS

Although both the chub and the darter continue to do well, both should continue to be closely monitored because of their small ranges. Many populations of both have already been extirpated, and development of the area will undoubtedly continue. The two threats are man and the beaver. The beaver in North Carolina had been eradicated by 1897, but its reintroduction and protection beginning in 1939 have been highly successful (Taylor, 1985). In Moore County, North Carolina, we noted four beaver-dammed streams, three large man-made lakes, and three smaller man-made impoundments at former sites for these fishes. Dams change lotic to lentic habitat, and specifically, reduce current, alter water temperature regimes (increase temperatures), change the substrate to one of soft bottom and increase water depth. These conditions are highly detrimental to these two fishes. Further, they favor a much larger number of warm water species such as pickerel *Esox* spp., redbreast sunfish *Lepomis auritus,* bluegill *L. macrochirus,* and largemouth bass *Micropterus salmoides* which presumably compete with, as well as prey on, the chub and the darter.

As a specific example of the effect of beaver, F. F. Snelson (pers. comm., 1990), noted in his field notes for 30 June 1974 that a site in Sandy Run in Moore County supported a healthy population of both the chub and the darter and that he collected 53 specimens of both species combined. He characterized the stream as "a very nice small brook with a continuous run of good gradient broken by log-debris jams and riffles which form small pools with undercut banks." He also

collected here chain pickerel *Esox niger, Notropis cummingsae, Noturus insignis,* and *Micropterus salmoides.* We visited this locality on 22 October 1988. Beaver had impounded the site and there was no evidence of a brook. The six species we took were *Notropis cummingsae,* creek chubsucker *Erimyzon oblongus, Aphredoderus sayanus,* blackbanded sunfish *Enneacanthus chaetodon,* bluespotted sunfish *E. gloriosus,* and dollar sunfish *Lepomis marginatus,* all typical of lentic waters.

Construction in the Sandhills which involves any potential alteration of high quality streams should be reviewed and regulated by the appropriate state agencies, such as the North Carolina Wildlife Resources Commission, the North Carolina Division of Environmental Management, and the South Carolina Wildlife and Marine Resources Department, and the beaver should be managed to safeguard habitat for the sandhills chub and the pinewoods darter.

Acknowledgments: We thank the following for assistance in collecting: B. Bragin, R. Breisch, D. Cloutman, C. Jensen, T. Lyons, D. Harning, L. Olmsted, J. Suh, F. Sweeney, A. Teti, B. Winner, and K. Zippel. D. Cloutman, Duke Power Company, E. Menhinick, University of North Carolina–Charlotte, and V. Schneider, North Carolina Division of Environmental Management, generously provided us with unpublished data on collections from the Sandhills area. E. Maurakis, University of Richmond, provided several localities. D. Crochet, South Carolina Wildlife and Marine Resources Department, provided chub locality records. F. Snelson, University of Central Florida, kindly provided field note data. S. Ross, North Carolina State University, made helpful comments during manuscript preparation. This research was supported in part by grants from the North Carolina Wildlife Resources Commission Nongame and Endangered Wildlife Program. We thank the North Carolina Wildlife Resources Commission and the South Carolina Wildlife and Marine Resources Department for issuing us the required scientific research permits.

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Received 12 April 1991

APPENDIX F

Inventories of Recorded Cultural Resources

For

Goodwill Plantation

Cooks Mountain

Rainbow Ranch

R.S. Webb & Associates

Cultural Resource Management Consultants
2800 Holly Springs Parkway, Suite 200 • P.O. Drawer 1319
Holly Springs, Georgia 30142
Phone: 770-345-0706 • Fax: 770-345-0707

June 20, 2013

Ms. Ramona Schneider
Haile Gold Mine, Inc.
7283 Haile Gold Mine Road
Kershaw, South Carolina 29067

Subject: Inventories of Recorded Cultural Resources
Goodwill Plantation, Cooks Mountain, and Rainbow Ranch
Proposed Haile Gold Mine Mitigation Tracts
Richland and Lancaster Counties, South Carolina
R.S. Webb & Associates No. 13-658-010p
Haile Gold Mine Reference No. PSA-HGM 2012-09

Dear Ms. Schneider:

BACKGROUND

During the period of June 12 through 17, 2013, R.S. Webb & Associates conducted cultural resources literature/records searches and prepared resource inventories for three tracts of land being considered by Haile Gold Mine for mitigation purposes. These tracts include Goodwill Plantation (2,559 acres) and Cooks Mountain (1,131 acres) in Richland County, and Rainbow Ranch (700 acres) in Lancaster County (Figures 1, 2 and 3).

METHODOLOGY

The information needed to compile the inventories was collected during a literature/records search at the South Carolina Department of Archives and History (SCDAH) and at the South Carolina Institute of Archaeology and Anthropology (SCIAA), both in Columbia, South Carolina. Databases/sources reviewed included SCDAH's ArchSite GIS database, the National Register of Historic Places (NRHP) and the South Carolina archeological site files.

RESULTS

Goodwill Plantation Tract

National Register of Historic Places: One NRHP-listed property, Goodwill Plantation, covers the entire project area and a portion of the property extends west beyond the study tract (Figure 1). Goodwill Plantation was listed on the NRHP in 1986 and is considered significant at the state level under the area of social history. By 1799, Goodwill Plantation was established as a working plantation by Daniel Huger, II, who used it to supply his lowcountry rice plantations. Goodwill Plantation thrived until the Civil War, which by that time was owned by Edward Heyward, a lowcountry planter. During the war, Heyward evacuated his lowcountry slaves to Goodwill. After emancipation, tenant farming drove the economy. The plantation was sold to George Wickes in 1869, who constructed and ran a mill from the property. Between 1874 and 1910, ownership changed numerous times.

Resources Recorded During the 1985 University of South Carolina Department of History Study: In 1985, eight archeological sites, three landscape features, and seven structures were recorded on Goodwill Plantation by the University of South Carolina Department of History (Applied History Program, Department of History, University of South Carolina 1985). The archeological sites are described as follows:

1) a Woodland period lithic and ceramic scatter
2) the site of the "Old mill" circa 1750-1827
3) the "Old Settlement" circa 1750-1820's
4) a "Cellar" circa 1750-1857
5) a chimney with ceramics and glass circa 1750-1857
6) a "Structure Site" with "Fields" and a "Possible Grave Site" circa 1756-1857
7) a "Probable Mill Site" pre-1857
8) a "Well Site, Probably Location of Stockade Site" circa 1893

The recorded landscape features are comprised of:

1) a post-1750 "Ford" or "Ferry Location"
2) "Embanked, Irrigated Alluvial Fields" circa 1779-1820
3) a "Portion of Old Statesburg Road" circa 1827-1857

The Statesburg Road section features an elevated approach to a crossing over a diversion canal and the remains of a wooden bridge.

The structures consist of:

1) a pre-1857 "Overseer's House"
2) two "Slave Cabins" circa 1858-1864
3) the two-and-a-half story "Mill" with intact machinery circa 1858-1870
4) a "Blacksmith's Shop" circa 1865-1910
5) the "House Above Millpond" circa 1888-1894
6) a post-1900 "Tenant House"
7) a post-1900 "Lodge"

NRHP Web Site Goodwill Plantation Listing: Currently, the NRHP web site for listed properties in South Carolina identifies nine extant historic structures and two specific landscape features. Structures include:

1) the "Main House"
2) the "Overseer's House"
3) the "Mill Building"
4) "Slave Cabins"
5) the "Tenant House"
6) the "Lodge"
7) a "Carriage House"
8) a "Barn"
9) a "Corn Crib"

Landscape features are comprised of:

1) the "Mill Pond"
2) a "portion of the canal irrigation system"

2013 South Carolina Archeological Site Files Review (SCIAA): Three archeological sites are recorded within the Goodwill study site (Figure 1). Two of these are known by site form only. They are:

1) 38RD1196, an 18th century chimney pile/artifact scatter
2) 38RD1197, a Middle/Late Archaic lithic scatter and an Early Woodland lithic/ceramic scatter

The third archeological site was recorded within the Goodwill study tract in 1973 during the survey of the Wateree-Pineland 230 KV power transmission line corridor (Miller 1973) (Figure 1). Site 38RD0070 was identified as an 18th century ceramic/glass scatter.

2013 ArchSite Database Search: In addition to the archeological sites discussed above, a search of the ArchSite database revealed that two historic resources are present within the study tract. One is the NRHP-listed Goodwill Plantation, which is discussed above. The other historic resource, Resource No. 139-3564, is an interpretive marker entitled, "Wateree River Ferries" which is presumed to be near the location of the historic ferry crossing on the nearby Wateree River (The Jaeger Company 1993) (Figure 1).

Cooks Mountain Tract

National Register of Historic Places: No properties eligible for, or listed on, the NRHP have been recorded within the Cooks Mountain tract. The NRHP-listed Goodwill Plantation abuts the southern boundary of the study tract (Figure 1).

2013 South Carolina Archeological Site Files Review (SCIAA): The 1973 archeological survey of the Wateree-Pineland 230 KV power transmission line corridor (Miller 1973) noted above may have passed through the southwestern corner of the study tract. No archeological sites were found in this area during this study and no recorded archeological sites are present elsewhere within the Cooks Mountain study site. More than half of the Cooks Mountain tract is composed of Wateree River swamp, which could explain why no cultural resources have been recorded in the norther two-thirds of the study tract. A review of the topography in the southern third of the study tract indicates that there are a number of locations that would have been suitable for prehistoric and historic human occupation. The lack of recorded resources in this area is probably due to the lack of a systematic survey for such resources.

2013 ArchSite Database Search: A search of the ArchSite database identified one resource within the study tract, Cooks Mountain (Figure 2; Resource No. 139-3573) (The Jaeger Company 1993). Cooks Mountain is primarily a remarkable and prominent natural feature; however, the mountain was well known to early historic travelers/explorers and became an important landmark. During his travels through the area in 1700, John Lawson commented on this feature. In 1770, surveyor James Cook bought, named, and lived on Cooks Mountain while commissioned to survey/map South Carolina. His detailed map was published in 1773 and shows "Cooks" as a place name on the west

side of Wateree River in the vicinity of the current study tract (Cumming 1974). This suggests that Cook's residence probably was located on or near Cooks Mountain.

Rainbow Ranch

No properties eligible for, or listed on, the NRHP have been recorded within the Rainbow Ranch tract. In fact, no previously recorded cultural resources are located within or immediately adjacent to this tract. The Rainbow Ranch tract covers 700 acres and a review of the topography in this area indicates that there are numerous locations that would have been suitable for prehistoric and historic human occupation. The absence of recorded cultural resources within the study tract is probably due to the lack of a systematic survey for such resources.

CONCLUSIONS

Cultural resources inventories were compiled for the three mitigation tracts and a limited number of cultural resources have been identified. Based on topographic map review, there are numerous locations within each study that are suitable for prehistoric and/or historic human occupation. The overall low frequency of resources within these tracts is probably due to a lack of systematic survey.

CLOSING COMMENTS

Ms. Schneider, we appreciate the opportunity to work with you on this project. Please contact me at 770-345-0706 if you have any questions or comments about our findings.

Sincerely,
R.S. WEBB & ASSOCIATES

Robert S. (Steve) Webb
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Attachments: Figures 1, 2, and 3

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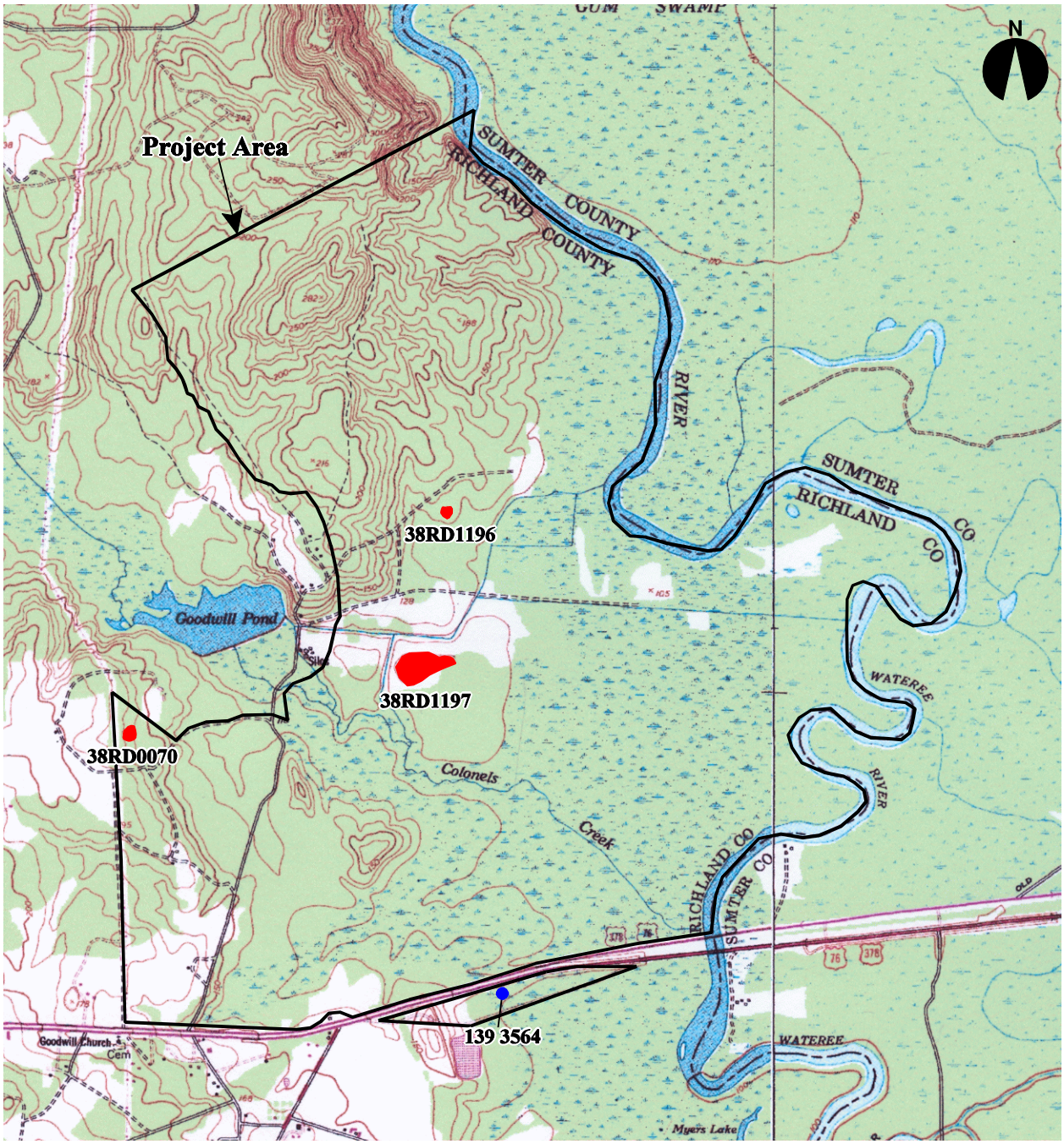
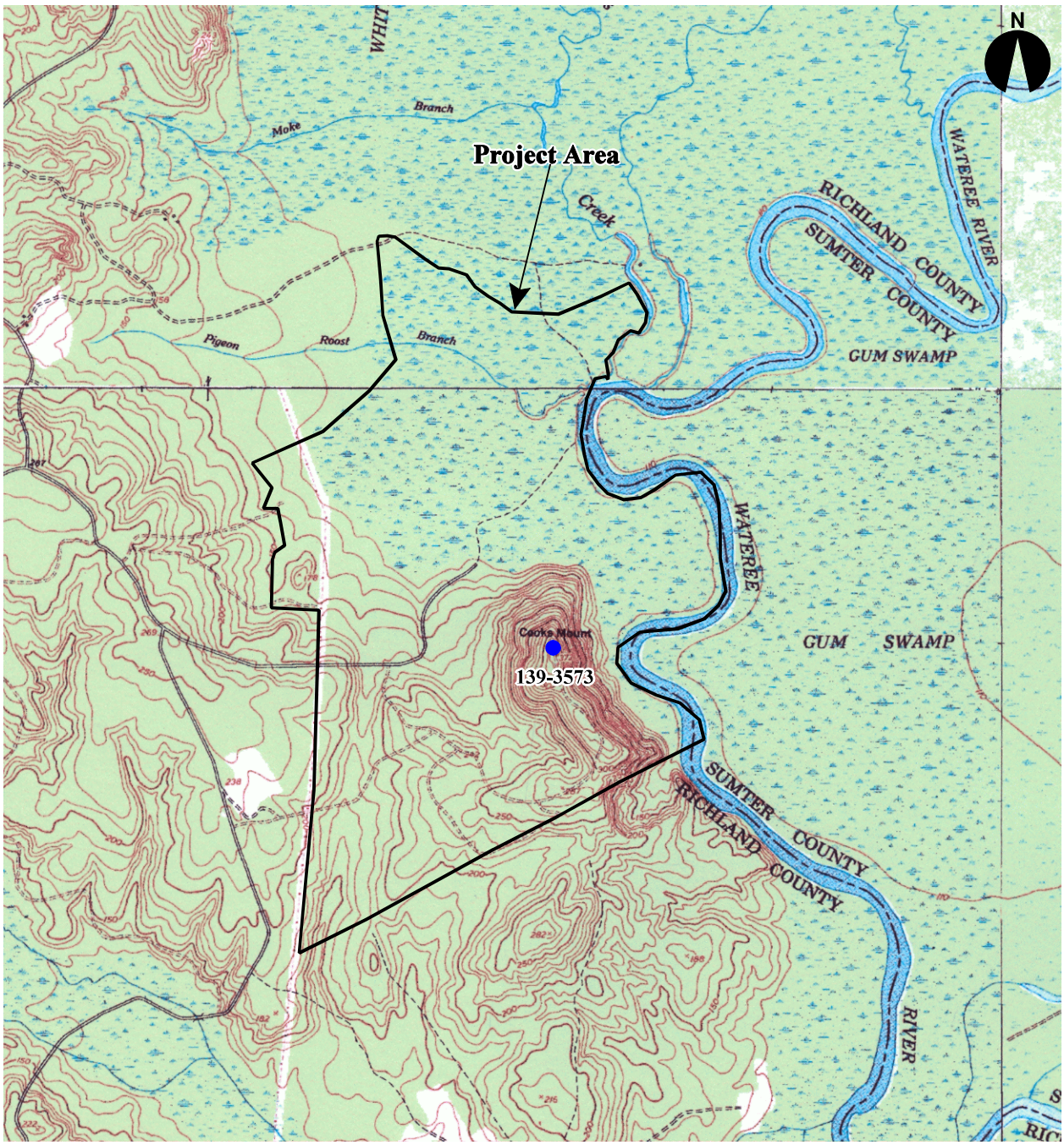


Map Reference: 7.5 Minute USGS Quadrangles
Eastover (1953 PR 1982 PI 1987) and
Wedgefield (1953 PR 1982), South Carolina

Scale
0 792 meters
0 2600 feet

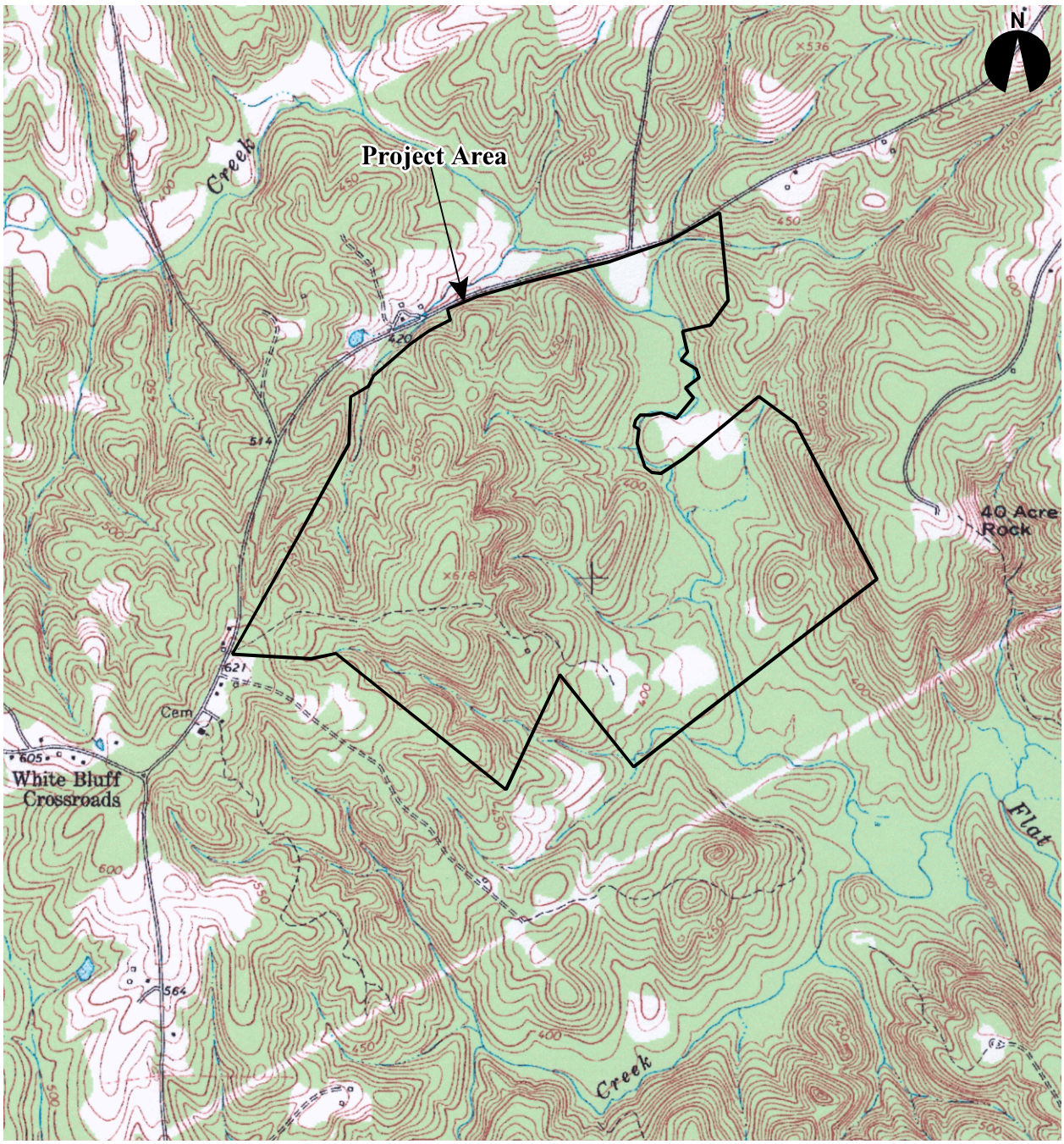
Figure 1 Goodwill Plantation Mitigation Tract Showing Previously Recorded Cultural Resources



Map Reference: 7.5 Minute USGS Quadrangles
Eastover (1953 PR 1982 PI 1987,
Leesburg (1953), Rembert (1953), and
Wedgefield (1953 PR 1982), South Carolina

Scale
0 792 meters
0 2600 feet

Figure 2 Cooks Mountain Mitigation Tract Showing Previously Recorded Cultural Resources



Map Reference: 7.5 Minute USGS Quadrangle
Taxahaw, South Carolina (1969 PI 1983)

Scale
0 610 meters
0 2000 feet

Figure 3 Rainbow Ranch Mitigation Tract (No Previously Recorded Cultural Resources Present)

APPENDIX G

SCDNR Evaluation of Goodwill Plantation

I. **Project Name:** Goodwill Plantation.

II. **General Location:** Goodwill Plantation is located in Richland County, immediately east of the Richland/Sumter county line formed by the Wateree River. Goodwill is approximately fifteen from both Columbia and Sumter. At the northern boundary of the property is Cooks Mountain, a large and well-known sandhill feature already under conservation easement. The southern boundary is a four-lane highway, US-76/US-378. To the west is private land. The property is compact in form, free of in holdings, and owned entirely by one private individual, Mr. Larry Faulkenberry.

III. **Description of Significance:** Goodwill Plantation was named in 1795 by Daniel Huger, the original owner. Huger was a prominent South Carolinian, and the plantation is rich in history, originally being a "supply" plantation, producing food for the slaves and workers at Huger's two other plantations.. The original 7,465 acres comprising Goodwill has been reduced to 3,285 acres, the current size of the property. The property has changed ownership several times through its history, and also changed crop production, from subsistence crops to cotton and subsistence crops to the current management regime for timber.

A number of important cultural resources exist on the Goodwill Plantation beginning with prehistoric archaeological sites (as yet unrecorded in the Statewide Site Archaeological Site Files), and European settlement began about 1750. Daniel Huger II, who owned Limerick Plantation (part of which were nominated to the Statewide Assessment of Cultural sites in 1990) and Rice Hope (adjacent to Childsbury), began agricultural pursuits on Goodwill. Huger's son Daniel Elliot Huger bought Goodwill and 80 slaves from his father's estate in 1827. Later, Edward Barnwell Heyward, another low country planter bought Goodwill following Huger's death in 1854. He moved all of his low country slaves to Goodwill during the Civil War. Both Huger and Heyward were farmers producing cotton, corn, peas, beans, sweet potatoes, hay a small amount of rice, livestock and dairy products such as butter. From 1869-1874 George T. Wickes of New York owned Goodwill and operated a mill on the property.

In 1985 a cultural resources study identified ten extant structures including an antebellum mill and slave cabins plus an extensive network of embankments and waterways. Other sites were noted. In 2000, only three extant structures were located on Goodwill–an overseers house and two slave cabins which appear to be in good shape. The other structures appear to have been lost to a combination of Huricanne Hugo and neglect of a previous landowner. One cellar hole, two brick scatters and a sandstone chimney fall were noted in December of 2000. These will be archaeologically test excavated in January 2001 and GPS readings will be taken on any cultural remains identified.

To date, the biological assessment of Goodwill is based on a single late-fall survey by Heritage personnel. One species-element, *Macbridea caroliniana*, a globally rare flowering plant (GRANK: G2G3) was observed, in a small but apparently reproductive population. *M. carolinina* --with the fanciful common name of the Carolina egg-in- a-nest mint-- is endemic to South Carolina and Georgia, where it thrives in areas with permanent groundwater seepage associated with hardwood swamp

systems. Several large colonies of this stoloniferous, showy plant have been documented along the South Fork of the Edisto River, the Savannah River Site, and the Congaree National Monument, the latter site being the largest known site protecting the species in perpetuity. Goodwill Plantation will be the first attempt to include this species in the Heritage Trust system of preserves. This species is currently under review for listing under the U.S. Endangered Species Act upon completion of a range-wide status survey and evaluation by U.S. Fish and Wildlife Service. Another species-element, the Black Bear (*Ursus americanus*) was reported by Mr. Faulkenberry to be a sporadic occurrence on the property. Evidence of an extensive nesting site of colonial water birds was noted, but the identities of the birds are not yet known.

Although significance to individual rare or endangered species is presently unclear, Goodwill Plantation at 3,285 acres in size represents a unique opportunity for S.C. Heritage to protect a large tract of the sandhill type of the longleaf pine ecosystem. Existing Heritage Preserves in this region are relatively small (less than 1000 acres) and hemmed in by development. An exception is the Aiken County Gopher Tortoise Heritage Preserve; yet this site differs from Goodwill in several important respects:

- As defined by the Nature Conservancy's plant community classification system, the longleaf community at the Aiken County site is the G3-ranked "Longleaf Pine / Turkey Oak - Bluejack Oak / Southern Dwarf Huckleberry / Carolina Wineglass Woodland", while at Goodwill the predominant longleaf community is the G2-ranked "Longleaf Pine / Turkey Oak - Bluejack Oak / Southern Dwarf Huckleberry / Little Bluestem South Carolina Woodland". In other words Goodwill's non-wineglass variant–a South Carolina endemic–is, from a regional perspective, rare and in jeopardy.

- The Lakeland soils that typify the Aiken County site lack a clay layer and are deeply doughty, while at Goodwill Plantation the soil is noticeably clayey and stony, with superficial deposits of polished gravel. The distinctive soils of this region have long been recognized, lending the name "Red Hills" to the area (Cooke, 1936). One apparent result is the unusual occurrence of a variety of other pines–shortleaf, loblolly, and Virginia–on some upland sites in association with longleaf.

- The Aiken County site does not have the steep erosional topography of Goodwill Plantation, and consequently the variation in soil moisture availability at Goodwill can be more dramatic. According to SCDNR geologist Ralph Willoughby, the Coastal Plain strata in the lower slopes near Goodwill's Colonels Creek yield a steady and reliable water source to the surface and near-surface, while conversely, isolation (due to erosional incision) of upland remnants from an updip source of ground water may accentuate the dry conditions of certain upland sites. In a vegetation study along similar gradients in a comparable oak hickory forest along the Congaree River in nearby Calhoun County, Fitzpatrick and others (1977) recorded over 100 vascular plant species along transects with a horizontal distance of approximately 250 feet. Thus, along such modest topographic gradients with a elevation of approximately 300 feet above sea level, one quickly moves downhill from very dry pine to mesic oak hickory to moist beech dominated forests. See the Basin Landing species list of trees below.

- In summary, the soils of Goodwill Plantation may retard excessive drainage on some uplands while the topography may have an opposite effect on others. As a result the project area has great potential for diversity in upland forests.

Uplands account for 1,750 acres of the property, and bottomlands and creek basins for 1,275 acres. The lower topographic positions are occupied by at least four distinct natural communities:

1) In a shallow depression on the east side of the entrance road--
Water Tupelo - Swamp Blackgum Forest
Nyssa aquatica - Nyssa biflora Forest (G4G5)
The depression holds several inches of water during the winter season. The orientation of this feature suggests it may be a remnant Carolina Bay.

2) In the long narrow basin of a small tributary to Colonels Creek--
Pond Pine / Switch Cane Wooded Shrubland
Pinus serotina / Arundinaria gigantea ssp. tecta Wooded Shrubland (G1)
The GRANK of this community is intended only for very large sites and is not appropriate for this occurrence, which seems to be a cane patch that responded vigorously to a timber cut.

3) On northeast-facing slopes overlooking Colonels Creek–
Pond Pine - (Tuliptree) / Shining Fetterbush - Coastal Sweet-pepperbush - Little Gallberry Woodland
Pinus serotina - (Liriodendron tulipifera) / Lyonia lucida - Clethra alnifolia - Ilex glabra Woodland (G?)
A broad power line, said to be maintained by mowing rather than herbicide, cuts through this community and creates a potential 'hillside herb bog' setting.

4) On saturated organic soils along Colonels Creek--
Swamp Blackgum - (Red Maple) / American Holly / Coastal Doghobble / Howe Sedge Forest
Nyssa biflora - (Acer rubrum) / Ilex opaca / Leucothoe axillaris / Carex atlantica ssp. capillacea Forest (G2G3)
Although Colonels Creek has been diverted, this associated community remains intact; it is the site of the *Macbridea* collection.

A fifth significant community occurs on the high, steep bluffs overlooking the Wateree River at Basin Landing--
White Oak - Mockernut Hickory / American Strawberry-bush / Heartleaf Forest
Quercus alba - Carya alba / Euonymus americanus / Hexastylis arifolia Forest (G5?)
The steep, north-facing bluffs down to the landing support a mature and remarkably diverse assemblage of conifer and hardwood species of trees for the Midlands region of the state. Species recorded along Basin Landing Road included:

Pinus echinata (shortleaf pine)
P. palustris (longleaf pine)
P. taeda (loblolly pine)
*P. virginiana (*virginia pine*)*

Taxodium distichum (bald cypress)
Betula nigra (bald cypress)
Carya pallida (sand hickory)
C. tomentosa (mockernut hickory)
Carpinus americana (muscle tree)
Cornus florida (flowering dogwood)
Fagus grandifolia (American beech)
Ilex opaca (American Holly)
Liquidamber styraciflua (sweet gum)
Liriodendron tulipfera (tulip tree)
Planera aquatica (water elm)
Quercus alba (white oak)
Q. marilandica (blackjack oak)
Q. nigra (water oak)
Q. velutina (black oak)
Q. rubra (northern red oak)
Q. falcata (southern red oak)
Q. michauxii (swamp chestnut oak)
Q. montana (rock chestnut oak)
Vaccinium arboreum (sparkleberry)

IV. Surrounding Land Use: Goodwill Plantation is surrounded by rural lands managed primarily for timber, with hunting being an important use. The property directly north of Goodwill, Cook's Mountain, is under conservation easement but appears from aerial photography to be managed intensively for timber production. The eastern boundary of Goodwill is formed by the Wateree River, which is used for recreational fishing and boating. Timber in the floodplain forest of the Wateree has been extensively harvested in recent years.

V. Threats. Major threats to Goodwill include sprawl (unplanned development), pollution, habitat fragmentation, disturbance, or projects that could alter habitat or animal use patterns, degrade water quality, or result in other environmental impacts around the periphery.

Situated on a major highway into Columbia, and only fifteen miles distant, Goodwill Plantation is an 'ideal' location for residential development. While it is possible that low-density, well-planned development could protect the natural and cultural features found at Goodwill, it is also likely that development not carefully planned or environmentally sensitive could impact these resources severely.

VI. Overall Protection Strategy for the Featured Species. Goodwill Plantation, though not 10,000 acres, can be considered a large-area or landscape-scale project. At 3,000 acres, the site supports significant community diversity and provides habitat for numerous plant and animal species.

Considering its proximity to a rapidly expanding urban area, Goodwill Plantation is a significantly large tract of land.

In addition to its ecological significance, Goodwill is a significant cultural feature and presents an opportunity to address both natural area and cultural area protection in one property.

VII. Summary of Preserve Design. The 3,000-acre Goodwill Plantation is potentially a stand-alone preserve, and in addition it is located in a region that is of growing interest to the Heritage Trust Program. Goodwill can be considered within the preserve design for the recently approved Fork Swamp Project. Goodwill Plantation is located approximately fifteen miles north of the confluence of the Wateree and Congaree Rivers, and only a few miles north of the approved boundary for Fork Swamp. If approved, Goodwill could serve as an anchor property for the northern extent of the Fork Swamp Project.

VIII. Summary of Preserve Protection Strategy. Goodwill is a large and potentially expensive property. Outright acquisition and management as a classic Heritage Preserve may not be the best option for Goodwill. Staff recommends that, if the project is approved, we identify potential partners that share our ideas about protecting natural and cultural features on the property. Several options, including sharing acquisition costs or accepting conservation easements, should be explored.

IX. Management Recommendations. A significant proportion of Goodwill is altered. Much of the floodplain forest was cleared, possibly during post-Hugo recovery, and large areas remain in early stages of succession. Other portions of the floodplain and upland are currently in pine plantations. Currently there are three pine plantations on Goodwill comprising 176 acres, 93 acres and 27 acres respectively. The 93-acre pine plantation is contained within the floodplain, which comprises 952 acres of the total Goodwill acreage. There are also man-made impoundments, fields, food plots, and power lines within the property.

At the same time, Goodwill has outstanding restoration potential. Although the longleaf forest is not very old, a diversity of age classes are extant, from grass stage to bolting stage to mature trees; therefore restoring the longleaf forest will require little if any chemical or mechanical site preparation or tree planting. This is a significant advantage because longleaf restoration can be: (1) difficult due to poor survival of trees, (2) expensive, and (3) necessitate heavy-handed site preparation that may damage rare elements. Much of the proposed restoration of longleaf forest could be accomplished by aggressively implementing prescribed burns on a 1-3 year interval. Growing season as well as dormant season burns should be implemented as soon as possible.

In addition to the pine uplands, staff recommends that the floodplain forests be restored, and this may be achieved merely by leaving the bottomlands alone to recover. Plugging the historical canal that diverts Colonels Creek should be considered, as this would restore some of the original hydrology of

the floodplain. Feral hogs appear to be a problem, and staff recommends that action be taken to reduce and control the population.

Sites such as Goodwill, with extensive acreage in a diversity of age classes of longleaf, are rare in South Carolina. Moreover, the rocky and hilly edaphic/topographic conditions are unusual in longleaf forests.

X. List of Rare Elements and Their Ranks:

Macbridea caroliniana	G2G3
Colonial waterbird rookery	Special Concern
Water Tupelo - Swamp Blackgum Forest	G4G5
Pond Pine / Switch Cane Wooded Shrubland	*G1
Pond Pine - (Tuliptree) / Shining Fetterbush - Coastal Sweet-pepperbush - Little GallberryWoodland	G?
Swamp Blackgum - (Red Maple) / American Holly / Coastal Doghobble / Howe Sedge Forest	G2G3
White Oak - Mockernut Hickory / American Strawberry-bush / Heartleaf Forest	G5?

*The G1 ranking would be appropriate only for occurrences much larger than those found on Goodwill.

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XII. Authors.

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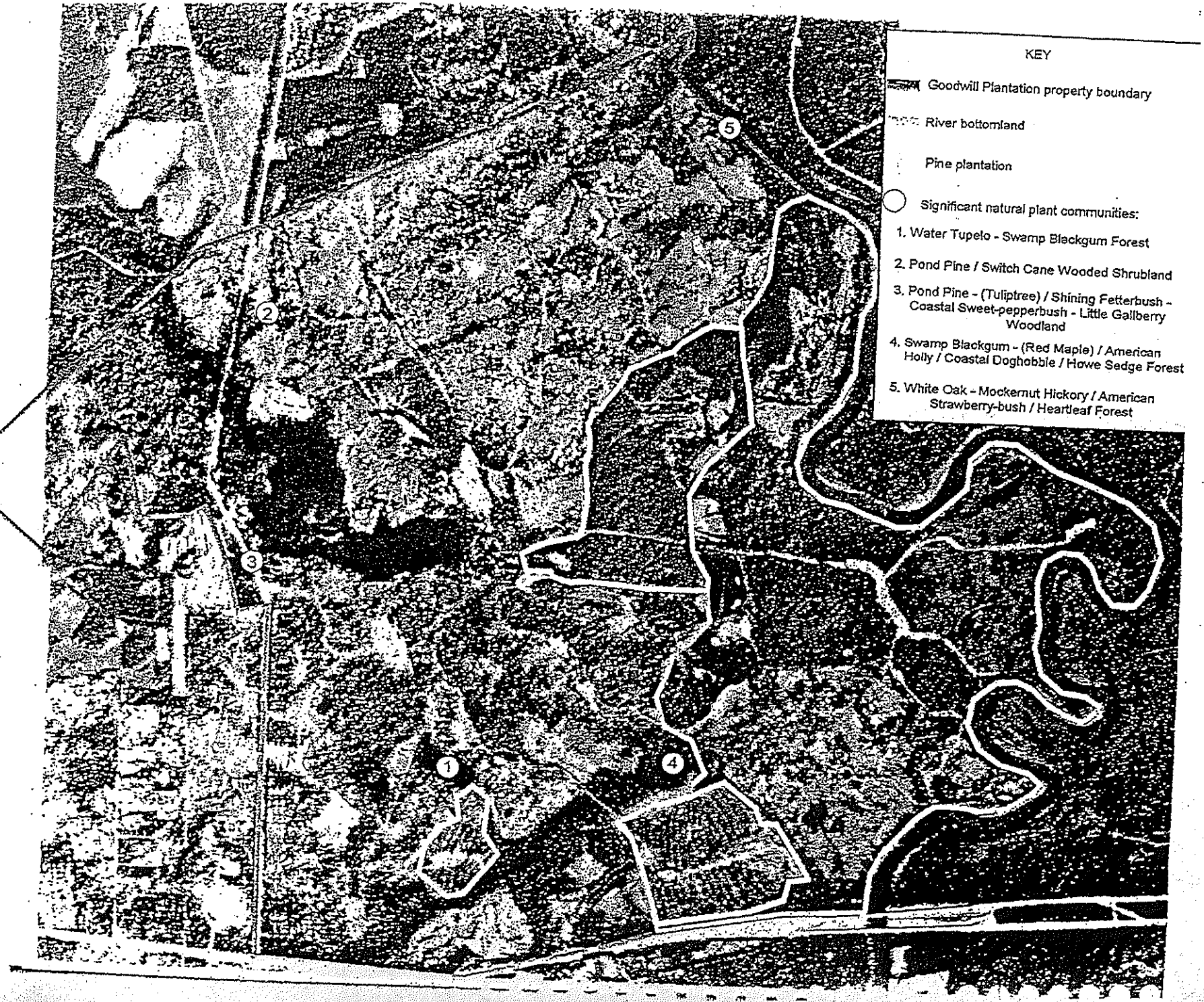
January 10, 2001


KEY
Goodwill Plantation property boundary
River bottomland
Pine plantation
Significant natural plant communities:
1. Water Tupelo - Swamp Blackgum Forest
2. Pond Pine / Switch Cane Wooded Shrubland
3. Pond Pine - (Tuliptree) / Shining Fetterbush - Coastal Sweet-pepperbush - Little Gallberry Woodland
4. Swamp Blackgum - (Red Maple) / American Holly / Coastal Doghobble / Howe Sedge Forest
5. White Oak - Mockernut Hickory / American Strawberry-bush / Heartleaf Forest
1
2
3
4
5

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